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CONTENTS

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Excavation at Wort's Farm in 1971

by Jim Weil
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During the 1971 spring semester the field archaeology class from Columbia University continued excavations at Wort's Farm. The site is located in southwestern Staten Island near Arthur Kill, a waterway which marks the New York - New Jersey state line. Previous findings are reported in publications of the Staten Island Institute of Arts and Sciences (Barritt 1964; Williams 1968; Deustra 1969; Horwitz 1971). Archaeological survey of the site dates back at least to the first decade of this century (Skinner 1909).

Professor Shirley Gorenstein directed the student workers. The 1971 findings conform substantially to the collections of other years. In this account the types and numbers of artifacts are analyzed. A discussion of artifact provenience follows, which emphasizes stratigraphic problems at the Wort's Farm site.

Excavation in seven trenches (numbered from VII to XIII) has yielded 126 artifacts of which all but five are lithic. The exceptions are ceramic fragments. The lithic collection includes several questionable finds and much debitage. Many argillite pieces are recognizable as artifacts only because this mineral, not naturally occurring locally, must have been imported (Rutsch 1968: 77-78). The relatively small size of the 1971 collection allows a somewhat more detailed analysis of the artifacts than might otherwise be feasible. Table 1 provides the description and location of each. A convenient categorization of the finds distinguishes Core Artifacts from Flake Artifacts—subdividing the latter into Undifferentiated Flakes, Blade Tools and Bifacially-Worked Tools—while Ceramics are treated separately.

The Collection

Core Artifacts

The core artifacts include unworked stone tools and pieces of

stone from which flakes have been knapped. One cobble, the largest and heaviest item in the collection, fits comfortably in one hand and shows peckmarks on its faces (VII-24).* There are eight rounded pieces of sandstone, some with chipping scars suggesting use as hammerstones (VII-54, VII-58, IX-10, IX-14, IX-18, IX-21, X-6 and XII-11). A flat piece of sandstone bears possible evidence of unifacial working with its two edges tapering to a point (XI-6). A pyramidal piece of quartzite, its use unknown, is also included (XII-19). There is one chert core with several flake scars (XI-1); one brown chert nodule, possibly worked (VIII-8); six broken chert nodules (VII-35, VII-46, VIII-34, IX-12, IX-16 and XI-8); and one small, scarred, jasper pebble (VIII-9). Finally, there is one parallelepiped piece of argillite measuring $4\frac{1}{4}''$ by $1''$ by $\frac{5}{8}''$ (IX-14). Its rounded, tapering symmetry indicates purposeful working, but its function is not apparent.

Flake Artifacts

A wide range of artifacts categorized as flakes includes fragments obtained when a knapper applies force (percussion or pressure) to the edge of suitable lithic materials. Flake artifacts can be recognized by their substance and form. The toolmaker chooses certain minerals and rocks because they fracture easily and consistently, yielding hard-edged fragments. These may bear preparation scars and marks of impact force, which are often obscured by subsequent working or weathering (Bordaz 1970: 9-12). Ground or polished tools, manufactured either from cores or flakes, constitute a separate category not represented in this collection.

Undifferentiated Flakes. Chert—including jasper and flint—and argillite predominate among the undifferentiated flakes. It is usually unclear whether or not they were utilized.

The 41 chert specimens range in color from light tan (VIII-19 and XI-16a) to an almost black flint (XI-29), and in size from $\frac{9}{16}''$ long (VII-34) to $2\frac{7}{16}''$ long (XII-13). The majority shows preparation scars and a bulb of percussion; several have retouch scars (VII-27, XI-3, XI-26, XI-28 and XIII-3).

The assortment of 45 argillite flakes is noteworthy for its variability in texture: some specimens are fine-grained and soft like chalk (e.g., VIII-36), while others are coarse-grained and ap-

* The Roman numeral indicates the trench and the Arabic number indicates the artifact, as listed in TABLE 1.

proach the characteristics of siltstone (e.g., VII-18). While some have well-defined edges, the effects of weathering obscure any evidence of human manufacture. These flakes must be considered in connection with the blades and bifacially-worked tools in the collection, so that they may be compared in size and shape with argillite artifacts of known utility.

One additional flake is siltstone; it is notched and of possible use as a spokeshave (XIII-1).

Blade Tools. Artifacts categorized here as blades meet the criteria set out by Richard MacNeish:

> chipped-stone tools with roughly parallel lateral edges, a dorsal surface divided by one or more lengthwise ridges, and an unworked ventral surface, usually with a bulb of percussion near the end adjacent to the remains of the striking platform . . . (MacNeish, *et al.* 1967:17)

In addition, they should be at least twice as long as wide. One chert flake which does not meet this latter requirement is included (XII-24). One blade of near-perfect proportions has two longitudinal ridges parallel to the edges, and a semicircular distal end; the proximal end has been snapped, however (XII-12, see Figure 1a). There are two more possible blades of chert (XI-27 and XII-25), and one of argillite (VII-50).

Bifacially-Worked Tools. Five artifacts in the collection are points. Although this categorization depends primarily on morphology, function is also implied. All these artifacts are considered in relation to William A. Ritchie's typology of *projectile* points. He distinguishes arrowpoints, dartpoints, and points of throwing and thrusting spears, but issues a warning:

> Since in many, perhaps most, instances, the function cannot with certainty be deduced from the remaining part, the writer's attempts at such identification, where hazarded, are equivocal. (Ritchie 1961: 6)

He further notes that some points

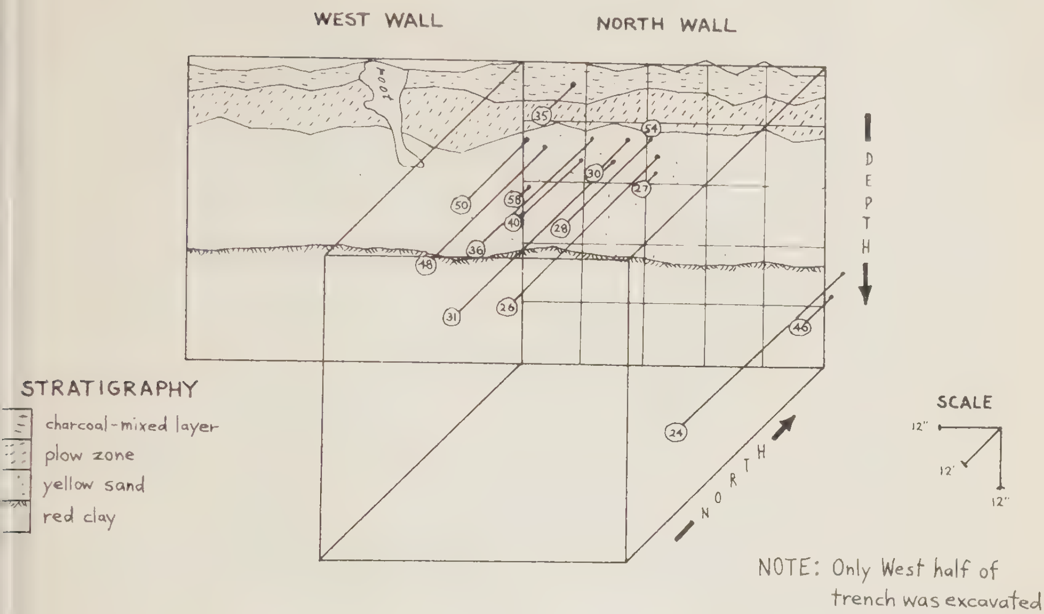
> may have been primarily or interchangeably used as specialized cutting tools or knives. (*Ibid*)

Most interesting is a large, tan chert point of a type not previously reported from Wort's Farm (VIII-18, see Figure 1b). Its attributes meet Ritchie's criteria for a Brewerton Side-Notched point (Ritchie 1961: 19). It would have been approximately 2¼″ long, but the tip is missing; it measures 1¾″ long by 1⅜″ wide (from shoulder to shoulder) by ½″ thick. Blade edges are slightly excurvate, and the expanding stem has a flat base. The corners

ARTIFACT	LOCATION	DESCRIPTION
	TRENCH VII	
3	Found in screen	Argillite flake
10	Top 6″ of West wall	" "
17	West half, top 6″ level (found in screen)	" "
18	Top 6″ level	" "
21	Third 6″ level	" "
24*	12½″N, 64″E, 40½″ deep: just above red clay	Rounded conglomerate rock; 3½″ x 3″ x 2″
25	NW quadrant, 40″ deep (found in screen)	Argillite flake
26*	27″E, 17″N, 19″ deep (found in screen)	" "
27*	26″E, 61″N, 22″ deep	Retouched, grey chert flake
28*	38″N, 24″E, 17″ deep	Argillite flake
29	24-45″N, 25″E, 14-20″ deep (found in screen)	" "
30*	54″N, 21″E, 15″ deep	" "
31*	13″N, 17½″E, 19″ deep	" "
33	Third 6″ level, 14″ from West wall	" "
34	Found in screen	Grey chert flake
35*	56″N, 10″E, 5″deep	Broken, brown chert nodule
36*	26″N, 14½″E, 14″ deep	Broken Bare Island or Lamoka point; argillite
40*	42″N, 12″E, 19½″ deep	Argillite flake
43	Third 6″ level (found in screen)	" "
44	NW quadrant, third 6″ level (found in screen)	" "
45	NW quadrant, third 6″ level (found in screen)	" "
46*	56½″N, 62½″E, 45½″deep (6″ deep in red clay)	Broken, brown chert nodule
47	56-72″E (in E wall), 5-6″ deep in red clay	Brown chert flake
48*	24″N, 5″E, 17½″ deep	Argillite flake
49	Second 6″ level (found in screen)	" "
50*	45″N, 2″E, 16½″ deep	Argillite blade
51	Third 6″ level (found in screen)	Argillite flake
54*	66½″N, 23½″E, 16″ deep (in N wall)	Sandstone
56	From N wall, yellow sand layer (found in screen)	Argillite flake
58*	60″N, 1″E, 25½″ deep	Sandstone

*=See diagram

ARTIFACT PROVENIENCE:



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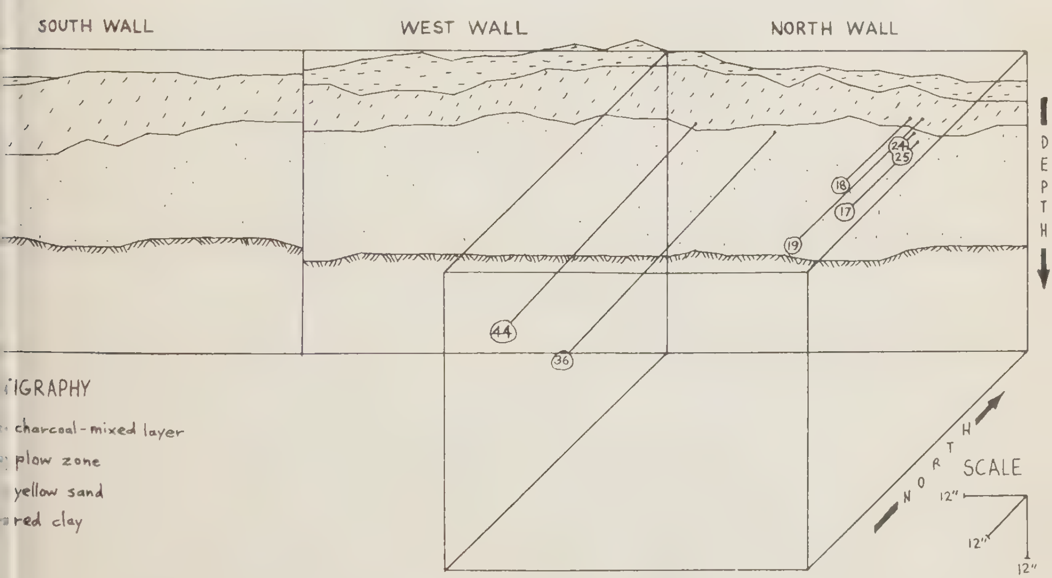
Trench VII



Trench VIII

ARTIFACT	LOCATION	DESCRIPTION
	TRENCH VIII	
8	Plow zone (found in screen)	Brown chert nodule
9	" " " " "	Red jasper nodule
12	" " " " "	Chert flake
13	" " " " "	Brown chert flake
14	" " " " "	" " "
15	" " " " "	Red-brown jasper flake
16	" " " " "	Argillite flake
17*	21″S, 22″W, 18-19″ deep	Brown chert flake
18*	21″S, 49″E, 14″ deep	Brewerton side-notched point; dark tan chert
19*	39″S, 51″E, 14″ deep	Light tan chert flake
20	E half of trench, 14″ deep	" " " "
21	" " " " " "	" " " "
24*	5″S, 49″E, 15½″ deep	Argillite flake
25*	" " " "	" "
30	E half of trench, 19-21″ deep (found in screen)	" "
34	SE quadrant, 22-39″ deep	Grey-brown chert flake
35	W half of trench, 22-39″ deep	Argillite point
36*	66″S, 21½″E, 16½″deep	Argillite flake
37	W half of trench, 13-22″ deep (found in screen)	Tan chert flake
39	W half of trench, 13-22″ deep (found in screen)	Argillite flake
41	NW quadrant, 13-16″ deep (found in screen)	Light tan chert flake
42	NW quadrant, 13-16″ deep (found in screen)	Tan chert flake
43	30-42″S, 0-15″E, 14-17″ deep (found in screen)	Argillite flake
44*	3″N, 6″E, 14-17″ deep (found in screen)	" "
45	48-60″S, 24″E, 14-17″ deep (found in screen)	" "
46	12-24″S, 24″E, 15-17″ deep (found in screen)	Uncompleted Bare Is. (?) point; argillite
47	NW quadrant, 15-17″ deep (found in screen)	Argillite flake
48	0-6″S, 0-6″E, 15-17″ deep (found in screen)	Light tan chert flake
49	Found in screen	Argillite flake

*=See diagram

ARTIFACT	LOCATION	DESCRIPTION
	TRENCH IX	
5	Plow zone	Cord-marked potsherd
7	" "	" " "
9	13″S, 49″E, 15-16″ deep (found in screen)	Worked argillite
10	16″S, 59″E, 16″ deep	Sandstone
12	35″S, 0-36″E, 17-23″ deep (found in screen)	Brown chert nodule
13	36-37″S, W half, unknown depth (found in screen)	Argillite flake
14	37½″S, 26″E, 16″ deep	Parallelepiped argillite piece
16	43″S, 25″E, 22″ deep	Broken, brown chert nodule
17	44½"-46″S, E half, 0-21″ deep	Argillite flake
18	46-58″S, 56-68″E, 19½-21½″ deep (found in screen)	Sandstone
19	53″S, in E wall, 19″ deep	"
21	63″S, 3″W, 16″ deep	"
22	½″N, 32″W, 21½″ deep	Tan chert flake
	TRENCH X	
1	E wall (found in screen)	Tan chert flake
4	W half, ca. 23″ deep (found in screen)	Lamoka (?) point or stemmed knife; argillite
6	31″S, 46″W, 27″ deep	Sandstone
	TRENCH XI	
1	Found in screen	Tan chert core
3	" " "	Tan chert flake
5	" " "	Argillite flake
6	13″S, 43½″E, 16″ deep	Worked sandstone
8	NE quadrant, plow zone	Broken, brown chert nodule
9	Yellow sand, top 3″ level	Argillite flake
16	Found in screen	" "
16a	11″S, 4½″E, 15″ deep	Light tan chert flake
17	9″S, 45″E, 16″ deep	Worked argillite
23	10″S, 31″E, 17″ deep	" "
24	Found in screen	Tan-grey chert flake
25	7″S, 49½″E, 17″ deep	Argillite flake
26	Found in screen	Grey chert flake
27	" " "	Light tan chert blade
28	" " "	Grey chert flake
29	" " "	Black and tan chert flake

ARTIFACT	LOCATION	DESCRIPTION
	TRENCH XII	
4	Plow zone (found in screen)	Brown-grey chert flake
6	" " " " "	Tan chert flake
7	" " " " "	Argillite flake
8	" " " " "	Brown-grey chert flake
9	2″S of S wall, 6½″E, 14″ deep	Tan chert flake
11	1″N, 15″E, 14″ deep	Sandstone
12	1″N, 30″E, 17½″ deep	Tan chert blade
13	1½″N, 19½″E, 16½″ deep	Grey chert flake
15	8-24″ deep (found in screen)	Tan and brown chert flake
16	½″S of S wall, 48″E, 23½″ deep	Argillite flake
17	10-17½″ deep (found in screen)	Tan chert flake
18	5½″N, 59″E, 19½″ deep	Argillite; possibly worked
19	6″N, 29″E, 16½″ deep	Pyramidal, quartz-veined rock
22	21″N, 21″E, 8½″ deep	Grey chert flake
23	17″N, 7½″E, 14½″ deep	Tan-grey chert flake
24	12″N, 23″E, 14½″ deep	Tan chert blade
25	Found in screen	Tan-grey chert flake
26	14½″N, 1″E, 21″ deep	" " " "
27	13″N, 17-24″E, 24″ deep	Tan chert flake
28	9-21″N, 14-24″E, 29″ deep	Argillite flake
30	10½″N, 0-22″E, 18½″ deep	Tan chert flake
	TRENCH XIII	
1	Plow zone (found in screen)	Notched, grey siltstone flake
2	" " " " "	Tan chert flake
3	" " " " "	Dark brown chert flake
4	14-22″ deep, near S wall (found in screen)	Argillite; possibly worked
5	7″S, 39″W, 12″ deep	Grey chert flake
6	8½″N, 19″W, 18½″ deep	Argillite flake
7	9½″N, 45″W, 12½″ deep	" "
8	SW quadrant, 10-16″ deep (found in screen)	" "
9	W half, 10-16″ deep	" "
10	7″N, 55½″W, 15½″ deep	" "
11	Found in screen	Reddish potsherd
11a	" " "	" "
11b	" " "	" "
12	10-16″ deep (found in screen)	Tan chert flake

are notched but not symmetrically: the notching on one side forms an even semicircle, and on the other an irregular and longer indentation. Consequently, the shoulders, which are sharply defined, are not equidistant from the base. Deep flake scars give the blade uneven faces, and it appears that a thinning process may have been left incomplete. One might conclude that this, along with the missing tip and the irregular notching, indicates that the point was discarded before completion because of manufacturing errors. Other Brewerton Side-Notched points, however, exhibit nearly identical asymmetry (see particularly Plate 7, Number 10, in Ritchie 1961: 72), and furthermore, there is no reason to suspect that the tip broke off before completion and use.

The remaining bifacially-worked artifacts are badly weathered argillite. One is either a Bare Island or a Lamoka point, worn smooth, missing its tip and otherwise eroded (VII-36, see Figure 1c). The poor condition makes its diagnostic features ambivalent (cf. Ritchie 1961: 14-15 and 29-30). It measures 1³⁄₁₆″ long (without tip) by ¾″ wide by ¼″ thick. The blade had been ½ to ⅓ as wide as long. The broad stem expands slightly before meeting a slightly excurvate base.

One partially worked argillite piece may shed light on the procedure in the manufacture of a Bare Island point (VIII-46, see Figure 1d). While not a finished point, one end of this artifact has the size, shape and thickness of the half extending from the base to just beyond the shoulders.

Another possible point is especially eroded along one edge (X-4, see Figure 2a). If the blade at time of manufacture were as asymmetrical as now, this artifact could have been a stemmed knife. Its measurements are 1¾″ long by ⅞″ wide by ¼″ thick. Its attributes suggest classification as a Lamoka point.

The last of the argillite points is narrow and unstemmed (VIII-35, see Figure 2b). The dimensions are 1⅜″ long by ⅝″ wide by ¼″ thick. It has a fine point, excurvate blade edges, and a slightly concave base. It resembles the Fox Creek point, although shorter and narrower than the norm (Ritchie 1961: 50).

The five largest pieces of argillite bear a resemblance to each other suggesting a semicircular shape (IX-9, XI-17 see Figure 2c, XI-23, XII-18 and XIII-4). The diameter of each lies between 1¾″ and 2″. These artifacts are thin (¼″ to ½″), and their flat ends may have resulted from a snapping off to provide the working edge of a scraper.

FIGURE 1 Artifacts from Wort's Farm (drawn to scale)

a – Tan chert blade (XII-12)
b – Brewerton Side-Notched point; dark tan chert (VIII-18)
c – Bare Island or Lamoka point; argillite (VII-36)
d – Uncompleted point (Bare Is.?); argillite (VIII-46)

Ceramics

The five potsherds in the collection are too small and eroded to allow reliable classification. The two from one trench have a beige slip over a coarse, brown, grit-tempered, and poorly fired paste; they are exterior cord-marked (IX-5 and IX-9). The three from the other trench have a reddish-tan paste, are smoother grained, better fired, and one has interior cord-marking (XIII-11, XIII-11a and XIII-11b). As all pottery types identified in previous collections, these sherds probably belong to the Windsor tradition, which indicates Early Woodland occupation (cf., Williams 1963: 51).

Provenience of Artifacts

This discussion carries forward the concern of Williams and Horwitz with stratigraphy and the reconstruction of occupation sequences. In two respects the Wort's Farm site is not auspicious for the resolution of these issues: (1) the stratification is minimal, most artifacts deriving from a thick layer of undifferentiated yellow sand; and (2) artifacts near the surface, because of continual disturbances to the soil since colonial times, are unreliably positioned. It is nonetheless worthwhile to examine three-dimensional diagrams which show the location at which some of the artifacts were discovered (Figures 3a-3b). Significant vertical clusterings could reveal temporal information, and horizontal clusterings could suggest associations of artifact types.

Stratigraphy

Sandy hillocks cover the site, some bare and many with sassafras, briar, and other scrub vegetation. In some areas there is a thin surface layer of charcoal dust (the residue of a brush fire in 1963), or a few inches of sandy humus. Roots and other organic matter are found in occasionally dense patches to a depth of 12″ or more.

Yellow sand predominates, mixed toward ground surface and more pure below, until it gives way to red clay at a depth of about 40″. Although artifacts were found at the upper margin of the red clay during a previous season (cf., Horwitz 1971: 36, 43), more extensive excavations in this stratum now suggest that it is culturally sterile. Between the historically disturbed "plow zone" and the clay bed, then, the source of significant

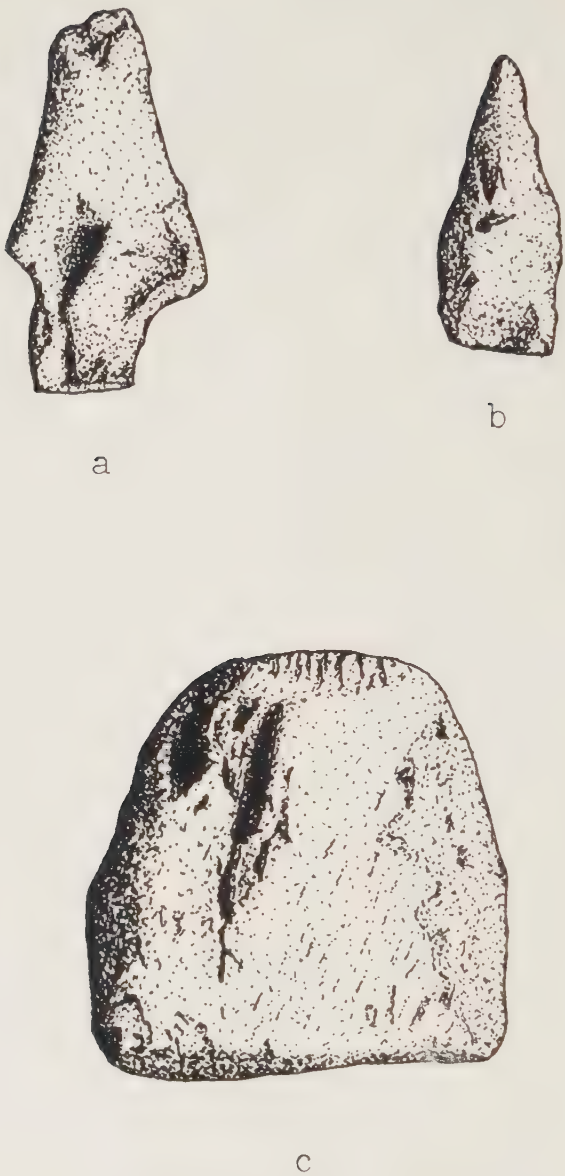


FIGURE 2 — Artifacts from Wort's Farm (drawn to scale)

a — Lamoka (?) point or stemmed knife; argillite (X-4)
b — Argillite point (VIII-35)
c — Worked argillite (XI-17)

artifactual remains is an essentially unstratified layer of yellow sand. Cultural sequences must emerge, if at all, within these 30-odd inches.

After preliminary survey and clearing, three teams of three students and two teams of four students excavated a series of seven trenches. Those who worked in trenches begun before the 1971 season removed the backfill and proceeded to slice with trowels into an exposed vertical face. Those who started new trenches shoveled away the topsoil and then scraped away arbitrary 3″ or 6″ layers. Some artifacts appeared only when a shovelful of excavated sand was thrown into a screen. In such cases the depth is reported as a given level, for example, 6″-12″. Otherwise, the precise vertical location of each artifact was recorded.

Horizontal location of each artifact was also noted wherever possible with one corner of the trench serving as reference point, such as X″ south and Y″ east of the northwest corner. Recorded information about artifact provenience thus designates three-dimensional space and not just stratigraphy.

Discussion

Inspection of the diagrams, as represented by Figures 3a, 3b, reveals no obvious clustering of artifacts. Statistical analysis would be required for the discovery of significant relationships, but for several reasons this has not been carried out here.

(1) In a collection so small, chances of distorted relationships prohibit dependable conclusions. Artifacts of definite utility are too few to constitute an adequate sample. Waste flakes (whether similar chert fragments or nondescript pieces of argillite) may be isolated finds or, on the other hand, segments of larger flakes and cores which have subsequently broken.

(2) We do not know if the depths of artifacts are reported relative to a single reference point, and must conclude that we are dealing with approximations. As can be seen in the tables, the positioning of some artifacts was measured from ground surface at the northwest corner of the trench, and the positioning of others was measured from a different corner. There is reason to suspect that "ground zero" points changed during field recording.

(3) In general, any significant evaluation of artifact provenience requires a more careful and consistent recording procedure than

was accomplished in the 1971 season. Of the 126 finds finally accepted as artifacts, the positioning of only 49 (that is, 31%) was precisely reported. Thus, the artifacts shown in trench diagrams total 14 of 30 in trench VII, 7 of 29 in trench VIII, 7 of 13 in trench IX, 1 of 3 in trench X, 5 of 16 in trench XI, 11 of 21 in trench XII, and 4 of 14 in trench XIII. Furthermore, although most artifacts derive from the yellow sand layer, trench profiles to provide confirmation of positioning near margins of neighboring strata are lacking for several walls.

Conclusions

The 1971 collection lends credence to past interpretations. Four artifacts identifiable typologically (at least tentatively) were found at depths representing Archaic occupations of the site. The type not found before at Wort's Farm, a Brewerton Side-Notched point, has been described as "the commonest point of all Archaic Laurentian complexes of New York" (Ritchie 1961: 19). This point (VIII-18), the broken Lamoka or Bare Island point (VII-36), the uncompleted Bare Island point (VIII-46), and the Lamoka point or stemmed knife (X-4) all derive from the yellow sand between 14″ and about 23″ deep.

The depth of the potsherds, representing Woodland occupations, is not at all clear. Wort's Farm site has been designated a recurrently occupied hunting site (Horwitz 1971: 43), and this is perhaps the only appropriate summation at this time.

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Aulacodiscus Species of Singiliewsky Flora

by Joseph F. Burke and Warren E. Flint

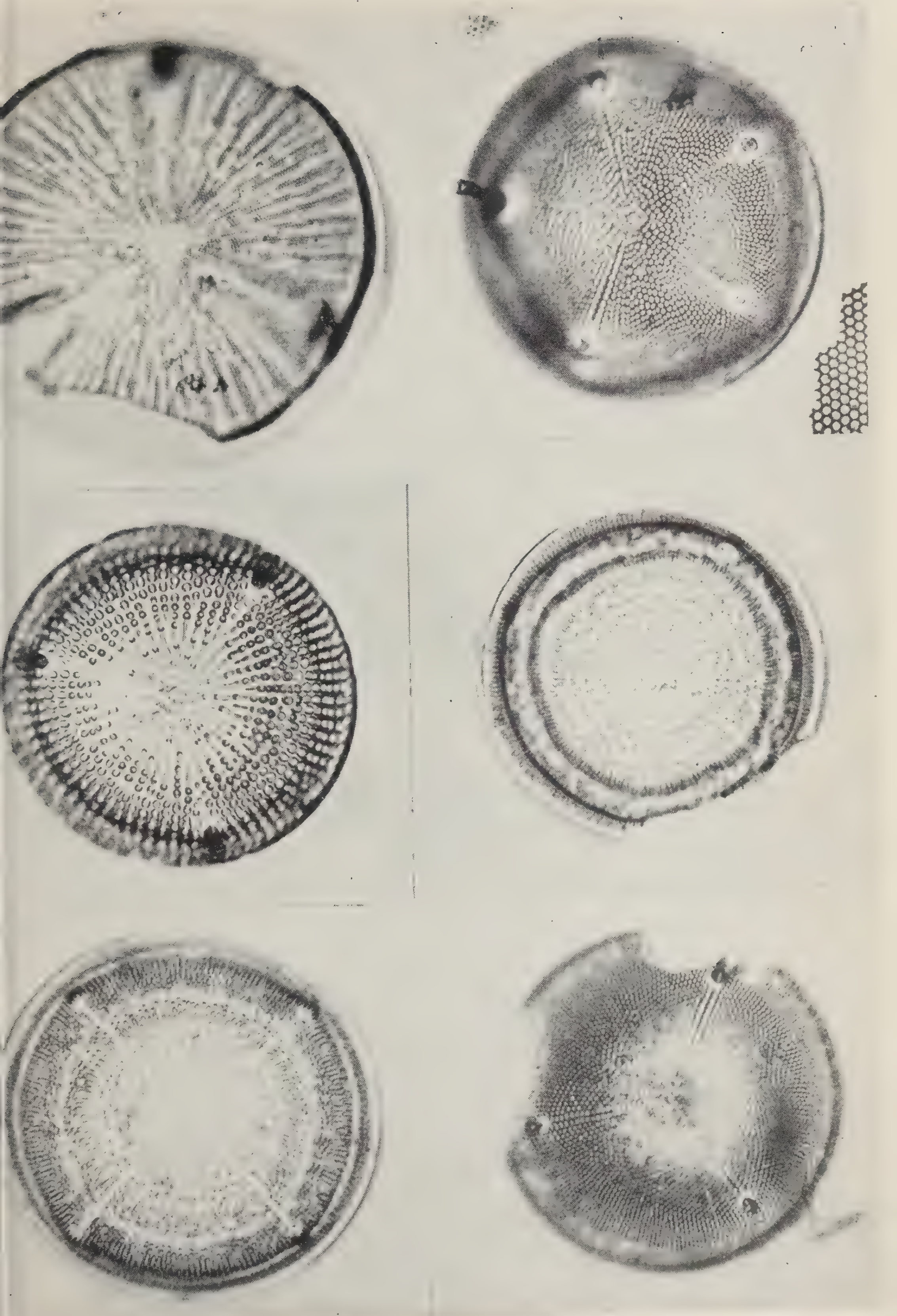
Since at least 1937 the place name Singiliewsky—with various spellings--has been used as the designation for the locality of a diatomaceous earth sample. It was mentioned by Dr. Fr. Meister, in *Berichte der Schweizerischen Botanischen Gesellschaft, band* 47, page 259, 1937 as Singiliewski, for material he had received from Chenevière in Montbéliard and/or A. Elger, Eutin, Holstein. It appeared as Singliewsky in an article by Lefébure and Chenevière, in *Bull. Soc. Fr. Mic.*, vol. 8, page 22, 1939. In *The Journal of the Quekett Microscopical Club* (4) 1:132, July 26, 1939, it was reported that A. Morley Jones, at a gossip meeting of the Club on October 26, 1937, exhibited selected diatoms from Singiliewsky, Russia.

Though this name has been widely used in the interim, doubt has been expressed by several authors as to its being the proper designation. It has been suggested that Sengilei, in the oblast of Ul'yanovsk, is the locality from which Chenevière's sample probably came.

In *Cryptogamic Plants of the U.S.S.R.*, vol. 7, by Z. I. Glezer, in the English translation published in Jerusalem 1970, there is a reference on page 36 to "Section near the town of Sengilei, Granoe Ukho quarry."

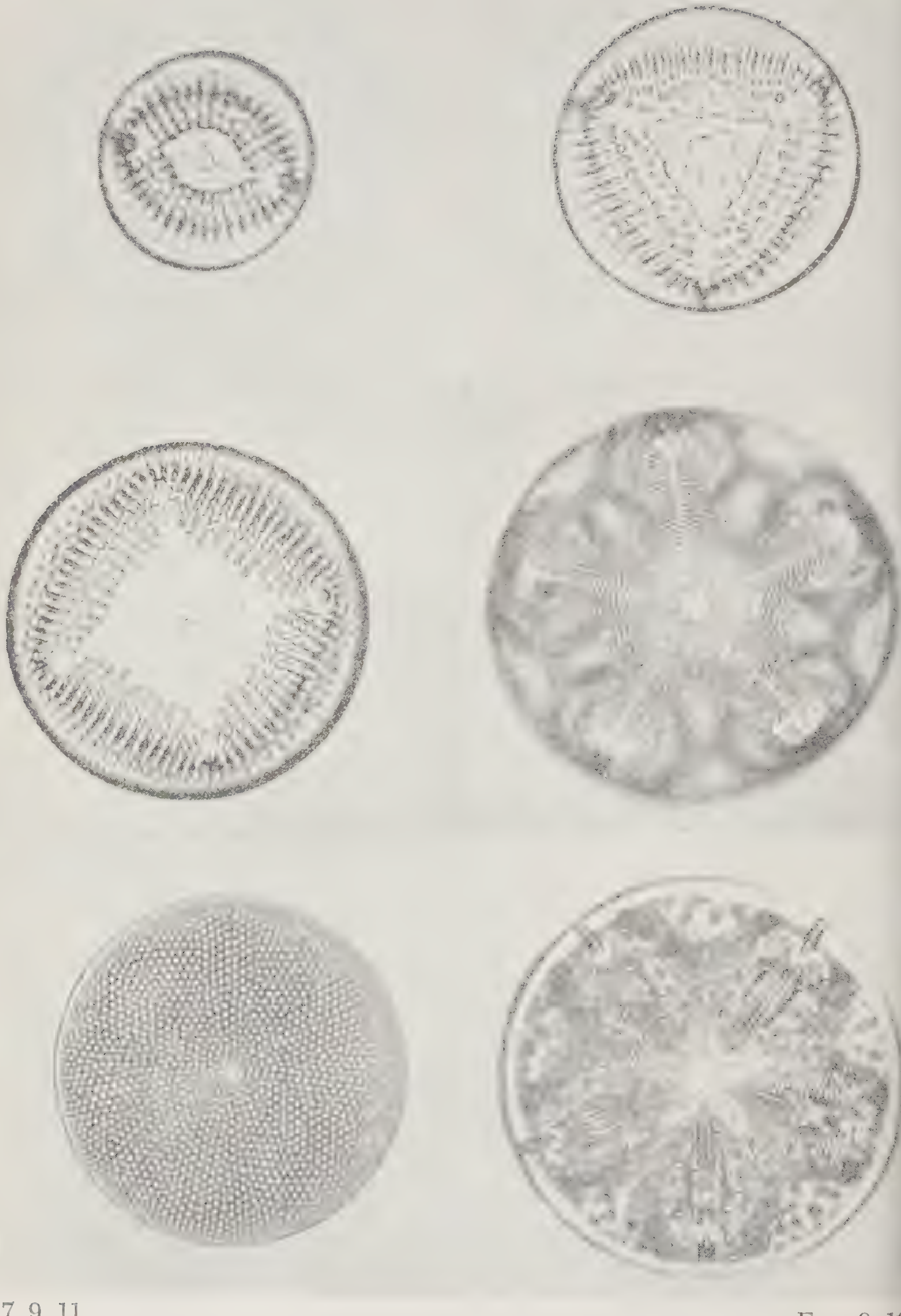
Figure Captions

1. *Aulacodiscus acutus* Rattray
   .120 mm. Singiliewsky
2. *Aulacodiscus eminens* Barker and Meakin
   .130 mm. Singiliewsky
3. *Aulacodiscus heterostictus* Barker and Meakin
   .100 mm. Singiliewsky
4. *Aulacodiscus lahusenii* v. *lahusenii* Witt
   .120 mm. Singiliewsky
5. *Aulacodiscus lahusenii* v. *marginalis* Witt
   .134 mm. Singiliewsky
6. *Aulacodiscus longicornis* Barker and Meakin
   .120 mm. Singiliewsky



Figs. 2, 4, 6

1, 3, 5



Figs. 7, 9, 11

Figs. 8, 10,

The Aulacodiscus flora of the Singiliewsky sample (assuming that when Chenevière received it, there was but one sample that became much divided later) differs in species from the Simbirsk flora of Aulacodiscus previously outlined,[1] partly by an inclusion of five new species named over a period from 1944 to 1948 by Barker and Meakin.[2] In addition to these five, the sample contained several species of the Simbirsk Aulacodiscus flora.

Of the species named by Barker and Meakin, *A. eminens* is abundant. Usually with four processes, it may have five and less frequently three or two. The processes are long and generally they are broken.

A. heterostictus is less frequent and does not vary much in appearance.

A. longicornis has long processes, frequently broken off, and in appearance shows little variation.

A. singiliewskyanus is abundant in the material and rather of uniform appearance until it starts to intergrade with *A. tuberculatus*, a species also abundant.

A. symmetricus is scarce and because of obscure processes and a Coscinodiscus-like appearance, it is apt to be passed over when searching the cleaned material for specimens of Aulacodiscus.

Of the species previously listed as part of the Simbirsk Aulacodiscus flora,[1] *A. septus* has not been found in the A. Elger sample used in this study. It was mounted by Dr. A. L. Brigger, California, and the late S. H. Meakin, Sheffield, England, from samples they had and in which it seemed to occur but sparingly.

A. lahusenii is present in several named varieties. These variations, however, scarcely warrant recognition as separable. *A. lahusenii* v. *lahusenii*, *A. lahusenii* v. *marginalis*, and *A. lahusenii* v. *punctatus* vary from one another by the relationship of the diameter of the central areolate portion of the valve as a percentage of the

Figure Captions

7. *Aulacodiscus septus* Schmidt
   .050 mm. Singiliewsky
8. *Aulacodiscus septus* Schmidt
   .080 mm. Singiliewsky
9. *Aulacodiscus septus* Schmidt
   .095 mm. Singiliewsky
10. *Aulacodiscus singiliewskyanus* Barker and Meakin
    .153 mm. Singiliewsky
11. *Aulacodiscus symmetricus* Barker and Meakin
    .091 mm. Singiliewsky
12. *Aulacodiscus tuberculatus* Pantocsek
    .135 mm. Singiliewsky

total diameter. If 50% or more, it arbitrarily has been considered to be A. *lahusenii* v. *lahusenii*. If under 50%, it has been considered to be A. *lahusenii* v. *marginalis*.[3] When the central area approaches nearly to the margin of the valve, it has been considered to be A. *lahusenii* v. *punctatus*. When the areolae of the central area are separated from the circular elevated ridge near the processes by a hyaline halo, the form is A. *lahusenii* v. *hyalinus* of Rattray (A. *lahusenii* v. *partitus* of Pantocsek). If the halo is filled with vermiform markings, the variety is A. *lahusenii* v. *verrucosus*.[4]

While A. *tuberculatus* was not listed for the Simbirsk Aulacodiscus flora,[1] it was named by Pantocsek from Ananino. However, it is in the Singiliewsky sample that it is abundant along with A. *singiliewskyanus*. An excellent opportunity is presented to study both of them, in variations that at times seem to bring the two together. Elsewhere the possible relationship of the two with A. *archangelskianus* is discussed.[5] It was suggested that the limited geographic distribution and the short geological time period might justify their consideration as being a single species.

The species illustrated in this article form a basic Aulacodiscus flora by which the deposit may be recognized. A study was made of a long series of slides mounted in 1963 by R. F. Lawrence, of New York, from a sample he had received from A. Elger, Eutin, in Holstein.

[1] Joseph F. Burke and Warren E. Flint, *Proceedings Staten Island Institute of Arts and Sciences*, vol. 27, pp. 59-67, November 1973.

[2] J. W. Barker and S. H. Meakin, *The Journal of the Quekett Microscopical Club*, series 4, vol. 1, p. 251, pl. 38, figs. 1 to 3, Dec. 1943, published February 29, 1944.
ibid vol. 2, p. 18, pl. 3, fig. 4, Dec. 1944, published April 30, 1945.
ibid vol. 2, p. 177, pl. 24, fig. 5, Dec. 1947, published February 27, 1948.

[3] Joseph F. Burke and John B. Woodward, *A Review of the Genus Aulacodiscus*, p. 36, January 30, 1965. Published by Staten Island Institute of Arts and Sciences.

[4] Joseph F. Burke, *A Review of the Genus Aulacodiscus*, p. 326, January 25, 1971. Published by Staten Island Institute of Arts and Sciences.

[5] *ibid* pp. 356-357, February 25, 1974.

ETHMODISCUS REX

Note on Negative from Gravelle Collection

Neg. No. 2117. Slide by E. Thum, Leipsig, Germany, from the U.S. National Museum. Dr. Albert Mann (loan). Very old slide; yellow balsam.

1.58 mm in diameter. Comment: hard to mount as an unbroken specimen—like a wet paper bag, according to Dr. Mann. Magnification 60 X. (Notes copied from the negative envelope.)

—*See reproduction from negative which appears on page 25.*

Gravelle's photograph showing the valve view of the diatom *Ethmodiscus rex* has excellent resolution and contrast considering the material and the mounting with which he worked. Markings on the silicified cell wall or frustule of diatoms were used as objects for testing the resolution of microscope lenses; those of *Ethmodiscus* are rather subtle. For example, Castracane (1885) described the genus as ". . . possessing an almost invisible sculpturing . . . it is with the greatest difficulty and by use of the greatest obliquity of illumination that the best instruments of the present day can reveal the exquisite delicacy of their ornamentation. The form of the valves of the specimens bearing these delicate markings which cannot be made out when they are mounted in balsam, but become visible in dry preparations . . ." As is noted above, the preparation photographed by Gravelle was mounted in balsam, which added to the difficulties he successfully overcame. Since this slide was made at the turn of the century, mounting diatom frustules in media with higher index of refraction than balsam has made possible greater resolution and contrast. In addition, the use of phase-contrast and interference phase-contrast microscopes also aids the photographer in increasing the contrast of these semitransparent cell walls, whilst sacrificing little resolution.

If a centric diatom like *Ethmodiscus* is considered to be thought of as a cylinder, then it is the "end-on" or valve view which is shown. The ends may be concave or, more typically, convex. The height of the unbroken convex dome of a valve of this diameter is estimated to be nearly half a millimeter (ca. .400 mm). Gravelle could utilize the limited depth of field of his microscope objectives

in this squashed and somewhat broken preparation. Even today, only the scanning and transmission electron microscope has sufficient depth of field to keep the entire unbroken valve in focus. Gravelle succeeded to a remarkable extent in putting the highly domed surface of the valve into focus—showing both the rosette of so-called mucous tubuoles (the ca. 80 large black spots surrounded by clear spaces in the center of the valve) and the rows of puncta radiating away from the central area. It is interesting to note that the thin friable silica-dioxide frustule of *Ethmodiscus* has independently been described by Mann in 1907 and by Ricard and Gasse in 1972 as being like a paper sac. Both authors agree to the difficulty in mounting the frustules. Dr. Albert Mann, at the U.S. National Museum, who loaned Gravelle this slide, analyzed the collections from a number of ships. This specimen may have come from collections of the U.S. Steamer *Nero* made during a cable survey. Mann (1907) writes ". . . a series of soundings was made over a long belt of sea bottom between the islands of Guam and Luzon, which I find are full of the gigantic *Coscinodiscus* [*Ethmodiscus*] *rex* Wallich, a diatom by no means common, but found here in such enormous quantities that the gatherings [collected by tallow on the sounding weight] are often a pure siliceous mass of the remains of this one species. This belt is over 3000 miles long east and west and of unascertained width . . ." However, Mann also analyzed samples from other ships, notably the U.S. Bureau of Fisheries ship *Albatross,* which collected material for him in the Pacific Ocean between 1888-1904. The source of this particular specimen is thus not known. *Ethmodiscus rex* is now known to have one of the most abundant diatom frustules in tropical marine deposits, and yet as Mann notes, it is found at very low concentrations in the plankton. This discrepancy in abundance has led to some interesting theories about the biology of *Ethmodiscus.* (Swift, 1973).

The identity of the valve as that of *Ethmodiscus rex* (Rattray) Wiseman and Hendey 1953 seems clear. Recently, Ricard (1970) has suggested that this species might more properly be called *E. gazellae*, but Venrick (1972) argues that *E. gazellae* and *E. rex* are separate species. The present designation follows Venrick's proposal.

—Elijah Swift

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Bird Counts on Staten Island 1973-1974

by Mathilde P. Weingartner

The Annual Christmas Bird Count was held on December 15, 1973. Up to that time the weather had been very mild. All waterways were open and many of the late migrants still were lingering here instead of winging their way south. We consequently had an exciting bird count.

The total number of species counted was 84, the third highest in our history. Twenty-five observers assisted in the count, which was a comfortable one for the day was mild with a temperature range of from 30° to 38° and light westerly winds at seven miles per hour.

At Sailors' Snug Harbor two great blue herons flew out of a grove of small evergreens. American crows were very numerous, especially near the Fresh Kills landfill.

Generally the count of black-backed gulls and herring gulls was lower than in previous years. Brant were counted at an extremely high figure. An American bittern was seen for the second time on this count; eight pintail and five shoveler ducks represented an unusual find. The entrance to Raritan Bay accounted for the majority of sea ducks which were counted. This is unusual; they are more frequently found nearer to Great Kills.

A Carolina wren finally reappeared on the scene, having been missing for a number of years. The very mild weather allowed us to clock two catbirds and a very high count of robins (273). In all the years of the count, no figure for robins anywhere near that high had been recorded. Another extremely high count was that of the 2,353 redwing blackbirds. A flock of 350 was seen on Todt Hill, darkening the sky above and covering every small twig of the tops of trees when they settled down.

Some of the northern finches had come this far south: evening grosbeaks, purple finches, pine siskins, and red- and white-winged

crossbills. Many of these were feeding on the abundance of sweet-gum seeds in our woodlands. Another count recorded at an all-time high was that of tree sparrows, white-throated sparrows, and song sparrows.

The only area that was not very productive was Great Kills Park. Recently declared part of the Gateway National Park, it was being abused by motorcycle riders, field trials for dogs, and by bow-and-arrow hunters who were observed shooting at anything alive. Hence all larger birds were not in evidence. Although a snowy owl had been seen in Great Kills Park only two weeks before the count, there were neither snowy nor short-eared owls present that day. The presence of bow-and-arrow hunters is therefore quite disturbing. Parks should provide refuge for wildlife, whether or not they are actual sanctuaries, and animals and birds that live or feed at parks should be protected, not harassed or destroyed by human users of open space.

Observers were: Doris Barlow, Mr. and Mrs. Philip Benjaminson, Esther Brewer, Vincent Cardinale, Stanley Caufield, Dean Chipman, Howard Cleaves, Robert Clermont, Mr. and Mrs. Nils Dahlstrand, Gloria Deppe, Charles Fallon, Howard Fischer, Susan Kerber, Kenneth Lewis, Anna Meyer, Charles Pearson, Celia Polomany, Mr. and Mrs. William Siebenheller, Henry Traub, Mathilde P. Weingartner.

The Waterbird Count was taken on January 13, 1974, a day on which a great deal of glare ice covered the inland waters. Most of the birds could be seen only on the bay shore. There was a scarcity of ducks and geese, even in Lower Bay and Raritan Bay.

The six observers were: Vincent Cardinale, Charles Fallon, Howard Fischer, Susan Kerber, Richard Zain-Eldeen, Mathilde P. Weingartner.

Christmas Bird Count, 1973. List of species and number counted in A.O.U. checklist order:

Red-throated Loon	3	Pintail	8
Horned Grebe	72	Shoveler	5
Pied-billed Grebe	3	Greater Scaup	1,991
Double-crested Cormorant	6	Goldeneye	126
Great Blue Heron	5	Bufflehead	412
American Bittern	1	Oldsquaw	103
Brant	294	Common Scoter	1
Mallard	273	Green-winged Teal	6
Common Black Duck	933	Red-breasted Merganser	1
Gadwall	1	Red-tailed Hawk	9

Rough-legged Hawk	8	Carolina Wren	1
Marsh Hawk	4	Mockingbird	53
Sparrow Hawk	12	Catbird	2
Pheasant	50	Robin	273
Black-bellied Plover	3	Hermit Thrush	9
Killdeer	37	Cedar Waxwing	7
Ruddy Turnstone	40	Starling	4,835
Common Snipe	14	Myrtle Warbler	25
Lesser Yellowlegs	9	English Sparrow	255
Purple Sandpiper	32	Meadowlark	13
Dunlin	57	Red-winged Blackbird	2,353
Sanderling	24	Rusty Blackbird	9
Great Black-backed Gull	1,456	Purple Grackle	7
Herring Gull	18,825	Cowbird	206
Ring-billed Gull	95	Cardinal	103
Laughing Gull	12	Evening Grosbeak	2
Bonaparte's Gull	420	Purple Finch	2
Mourning Dove	815	House Finch	31
Screech Owl	2	Goldfinch	23
Flicker	11	Pine Siskin	26
Hairy Woodpecker	4	Red Crossbill	3
Downy Woodpecker	49	White-winged Crossbill	1
Phoebe	1	Towhee	2
Horned Lark	40	Savannah Sparrow	8
Blue Jay	71	Slate-colored Junco	108
American Crow	3,996	Tree Sparrow	233
Fish Crow	4	Field Sparrow	21
Chickadee	59	White-crowned Sparrow	1
Tufted Titmouse	12	White-throated Sparrow	418
White-breasted Nuthatch	16	Fox Sparrow	27
Red-breasted Nuthatch	2	Swamp Sparrow	8
Brown Creeper	2	Song Sparrow	248
		Total:	39,748

Waterbird Count, January 13, 1974.

Red-throated Loon	1	American Widgeon	5
Horned Grebe	19	Greater Scaup	2,653
Brant	8	Goldeneye	40
Black Duck	578	Bufflehead	146
Mallard	107	Oldsquaw	2
Green-winged Teal	2	Ruddy Duck	3
		Total:	3,564

COMMUNICATION

Senator John J. Marchi
358 St. Marks Place
Staten Island, New York 10301

May 6, 1974

Dear Senator Marchi:

We, the undersigned, have noted with growing concern the destructive inroads being made by building contractors and by industrial expansion activity generally on the clay pit property in the south western part of Staten Island close to Arthur Kill Road. The clay pits in this area have apparently in the past been a source of commercial clays for the brick and ceramic industries and also of clay modelling material for local artists. The destruction of these clay pits through improper area development would therefore be regrettable for both commercial and artistic reasons. However, probably the main reason why we would like to see the clay pit area preserved is educational.

It is almost the only place on Staten Island where we can show our geology students fine examples of depositional processes in marine sediments of Cretaceous age brought down to this area millions of years ago presumably by the ancestral Hudson River. Many other interesting geological features and processes as well are to be found in this area such as organic beds of lignite, a variety of metal oxide and sulphide minerals and some colorful weathering processes. We would hope therefore that even at this late date some means can be found for setting aside and preserving this clay pit area as an important and unique educational asset, not only for our students but for the public generally.

Yours truly,

Professor G. Wasserman
Professor A. Ohan
Professor A. Kureshy
Professor E. Kaarsberg

ABOUT OUR CONTRIBUTORS

Jim Weil is a student in the Department of Anthropology at Columbia University. He participated in the excavation at Wort's Farm and completed the report on the 1971 work under the supervision of Dr. Shirley Gorenstein, anthropologist.

Joseph F. Burke and *Warren E. Flint* have devoted many years to the study of diatoms. Both are members of the New York Microscopical Society and both are past-presidents. Their business backgrounds have been finance and precision instrumentation respectively.

Elijah Swift received his B.A. from Swarthmore College, his M.A. and Ph.D. (oceanography) from Johns Hopkins University. He was a National Science Foundation trainee at Woods Hole Oceanographic Institute. Since 1969 he has been at Rhode Island University, as an Assistant Professor of Oceanography through 1973 and an Associate Professor from 1974. His field of research is morphology, taxonomy, ecology, physiology of phytoplankton, particularly the marine species.

Mathilde P. Weingartner is Curator of Science for the Staten Island Museum as well as Curator of the William T. Davis Wildlife Refuge. She has been the author of many articles printed in previous PROCEEDINGS and in other scientific publications. She is the author of "The Staten Island Walk Book."

PROCEEDINGS

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Technology Assessment

by George Vachtsevanos

I Technology Assessment or Technology Arrestment?

Kenneth Clark, in his brilliant "Civilisation" series states that there were times during the Dark Ages when "we made it by the skin of our teeth." It is very conceivable that we are in, or about to be in, such a period today. The kinds of decisions we make and the kinds of actions we take over the next fifty years on matters such as resource management, pollution, population, etc.,—that is to say, the technology assessment mechanism we utilize on these problems and the resulting political decisions that are made may well determine the fate of civilization for many centuries to come.

The mechanism to carry out this technology assessment function on a national scale has been created in the Office of Technology Assessment which is part of the legislative branch of the federal government but retains a considerable amount of authority for independent action.

First of all, what is technology assessment? A definition from the document "A Study of Technology Assessment" published by the National Academy of Engineering, July 1969, reads "the phrase 'technology assessment' was first introduced by Congressman Emilio Q. Daddario, chairman of the subcommittee on Science, Research, and Development, to characterize the socio-technical research that discloses the benefits and risks to society emanating from alternative courses in the development of scientific and technological opportunities."

The key phrase in this definition is ". . . socio-technical research that discloses the benefits *and* risks . . ." (emphasis supplied). In considering an assessment of the benefits and risks two distinct and diametrically opposite avenues of approach present themselves: the first is called the scientific method or process and the second is known as the adversary process. The latter process does not seek the truth. It seeks to win, sometimes by whatever means are

necessary. It marshals facts selectively using only those that fit a preconceived notion. It presents arguments that give the appearance of logic. The scientific process is precisely the opposite. It seeks the truth. It tests hypotheses against the facts. All the facts. It ruthlessly discards or amends those notions that cannot be supported by facts. Even long-accepted theories are constantly being re-tested as new facts are revealed. The adversary process, although perhaps not by the formal name, has been the principal means of settling arguments since the beginning of time. The caveman who clubbed his enemy over some disputed food or territory did so because he thought he was right. He was trying to win. He was engaged in the adversary process. More or less refined, this process is at the heart of our legal and political processes. On the other hand, the scientific method is artificial and alien to man's natural, emotional and thought processes. It is an evolution of man's methods in dealing with observed phenomena. Our understanding of nature and our means of dealing with a reluctant environment have been enormously advanced by the systematic application of the scientific method.

Any assessment mechanism, be it the Office of Technology Assessment or in a smaller scale, groupings of the scientific and engineering community, must operate in a logical and scientific manner if it is to be a viable operation.

Dr. Lee Du Bridge, former director of the Office of Science and Technology, in testimony before Congressman Daddario's subcommittee, in December 1969, issued the following warning: "one of the arguments for the establishment of a technology assessment capability is that in the past we often proceeded with a new technology without sufficient awareness of the totality of its consequences which, on balance, occasionally turned out to be negative, or to have some negative aspects. But it would be ironic indeed if in developing a mechanism for technology assessment we were to stifle technological innovation because of failure to take into consideration the broad range of measures, social, economic and political as well as technological, that can guide technological developments along beneficial lines. We must be sure that we are designing a technology assessment, rather than a technology arrestment mechanism."

Since final decisions on all major areas involving technology assessment are usually being made in the political arena, that is to say, utilizing the adversary process, the scientific and engineering community must strongly advocate the rational approach in the solving of our technological problems.

II *The Technology Assessment Process*

Let us attempt to define the technology assessment process via a brief, preliminary model. The National Academy of Engineering in the report, "A Study of Technology Assessment," identifies two types of assessment; those which proceed from a particular technology such as nuclear reactors, computers, etc., and those which take a general problem area as their starting point, such as air pollution, water pollution or the transportation problems of a particular metropolitan region.

The first version of the model defines the assessment process when it starts from a focus on a particular technology while the second proceeds from a particular problem area. By necessity, these models are presented in symbolic and qualitative form, include several simplifications and are only briefly outlined below. The model is constructed around three major factors: The first is the technology or technological application under consideration, i.e., the nuclear reactors, or the automobiles, or computers. The second factor includes those operational and physical systems which are affected by technology. These are called "fields of impact" and they range from parts of the physical environment such as air or water, to geographical regions such as a state, city or lake, to operational systems such as a freight distribution system to other technologies which may be affected by the application of a given technology. The third key factor in the model encompasses those population groups or participants which might be affected through application of the technology such as city dwellers, birds, striped bass, etc.

Considering first a technology assessment which starts from a particular technology or technological system we delineate the following steps :

1. Identify the particular technology. Carefully delineate the functions or objectives which that technology is meant to serve.
2. Identify "direct fields of impact," i.e., those which are affected directly by the technology under consideration.
3. Determine the change in the field of impact due to the first order effect of the technology. For example, if the technology under consideration is the automobile and the field of impact being examined is the air then the change in the field of impact would characterize the increase in contaminants due to the operation of automobiles.
4. Identify the "second and higher order fields of impacts" by noting the effect of the first order changes upon other fields of

impact. The process defined in steps 2, 3, and 4 may be continued to as many orders as is deemed both desirable and practicable.

5. Identify those population groups which are affected by the changes in the fields of impact.
6. Determine the changed characteristics of the various populations which ensue through the interaction of all the fields with the populations.
7. Identify alternative technologies, or systems of technology, which serve the same functions or meet the same objectives as the original technology under consideration.
8. For each alternative technology, perform the analysis called for in steps 2 through 6.
9. Evaluate the results of each of the technologies under consideration, i.e., evaluate the changed characteristics of the various populations which are caused, albeit indirectly, by the various technologies. This evaluation procedure is, of course, the most crucial component of the entire assessment process. The significance of the changed characteristics must be evaluated in terms of various goals, values and priorities. These would presumably differ for the various population groups, and in any event are highly subjective, qualitative factors.
10. Compare the evaluated results for the alternative technologies under consideration.

A brief outline of the sequence of steps that would have to be followed to carry out a problem-oriented technology assessment is as follows:

1. Identify the change in a field of impact which is of interest, e.g., pollution in the air.
2. Determine the change in the field of impact, e.g., measure the pollution.
3. Identify population groups affected by this change, e.g., city dwellers.
4. Determine the changed characteristics of the population group due to the change on the field of impact, e.g., lung disease.
5. Evaluate the changed characteristics of the population group due to the change in the field of impact, e.g., put a value on the decline in health due to this factor.
6. Identify the technologies which may contribute to each change in the field of impact, e.g., automobiles, factory smoke stacks.
7. Identify the functions served by each of these technologies.
8. Identify alternative technologies which can serve the same function presumably without the same detriments.

9. For each technology identified above perform the full technology assessment outlined in the first model presented above.
10. Compare and evaluate the various alternative technologies and combinations of technologies, for fulfilling the desired functions.

III. Technology Assessment and Environmental Engineering

Environmental engineering impinges on the technology assessment process at a number of critical points, involving both the performance of technology assessments and the implementation of the results of such assessments.

Environmental engineering, through its wide perspective and approach to problems, is particularly well suited to assist in the identification and delineation of alternative technological systems which can achieve similar objectives. This step is crucial to the assessment process, for until the technology or technological system can be viewed as one of several alternatives for accomplishing certain desired purposes, it is not possible to construct a scheme of evaluation for the technology or technological systems.

Monitoring and maintaining surveillance of environmental effects due to specific technological systems is essential to performing adequate assessments of pollution abatement devices and maintaining effective control over the implementation of the results of technology assessments.

Environmental engineering may contribute in expanding the general base of technical knowledge regarding the interface of technology and environmental processes thus assisting society to meet this difficult challenge.

Finally, it is clear that environmental engineering has an essential role to play in the assessment of technological innovations: to preclude or counteract their deleterious impacts on the environment, and foster their beneficial results for the environment, the economy and society at large.

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Aulacodiscus species in Moravian Tegel

by Joseph F. Burke and Warren E. Flint

BRNO (BRUNN)

In October 1885 P. T. Cleve published in *The Journal of the Quekett Microscopical Club*, series 2, vol. 2, pp. 165 to 177, a listing of marine diatoms found in Moravian tegel (marl or clay). The list was based upon a collection of mounted specimens sent to him by E. Thum, of Leipzig. (The concluding paragraph of the Cleve article read: "Specimens of the Tegel Diatoms, mounted as 'Typen Platen' can be obtained of Herr Thum, 2, Teichstrasse, Leipzig." It may be some of the slides are still in existence.)

Several species of Aulacodiscus were included in the listing:

Aulacodiscus argus (Ehrenb.) Schmidt. (Listed by Cleve as *Eupodiscus argus Ehrenb.*) This species was used extensively by Thum as a marker diatom on his selected slides. Possibly Cleve assumed that specimens so used were mounted as part of the Moravian flora. The species apparently does not occur in the material.

Aulacodiscus oregonus Harvey & Bailey. (Listed by Cleve as *A. oregonensis* Bailey.) Cleve cited the *Atlas der Diatomaceenkunde*, pl. 34, f. 4 and 5. Apparently the specimens observed by Cleve were *A. lunyacsekii* Pant.

Aulacodiscus amoenus Greville. Cleve cited the *Atlas der Diatomaceenkunde*, pl. 41, f. 13. The species observed by Cleve apparently was *A. neogradensis* Pant.

Aulacodiscus grunowii Cleve. While Cleve distinguished his new species as separate from *A. grevilleanus* Norman, his illustration indicates it was the latter species.

Appended to the article by Cleve was a list of additional species found by F. Kitton in the tegel sample cleaned by Thum:

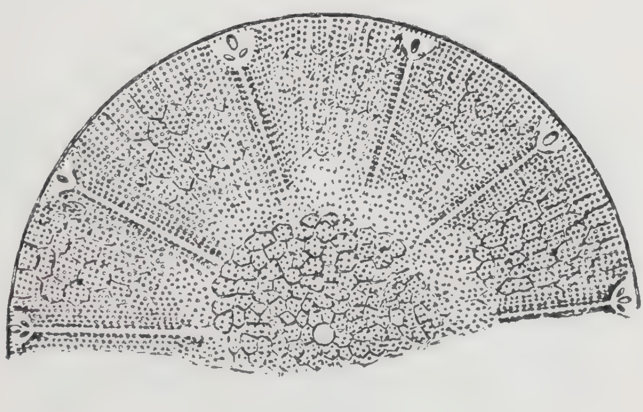
Aulacodiscus angulatus Greville. The solitary valve examined by Kitton probably was *A. hungaricus* Pant.

Aulacodiscus n. sp.—not named by Kitton. He compared it to *A. margaritaceus* Ralfs at one focus and to *A. argus* (Ehrenb.) Schmidt at another focus. It could have been *A. grevilleanus* Norman, which is quite variable. Some of the very dark specimens of the latter species would permit of Kitton's description. (Kitton stated fragments of Cleve's *A. grunowii* were frequent in the sample.)

In the *Atlas der Diatomaceenkunde*, pl. 92, f. 1, Schmidt illustrated, with a question mark, *A. grunowii* Cleve, from Brünn. He stated that Grunow doubted the identification. It would seem that Schmidt's figure represented *A. reticulatus* Pant., especially in the structure at the margin and in the network around the center, commented on by Grunow.

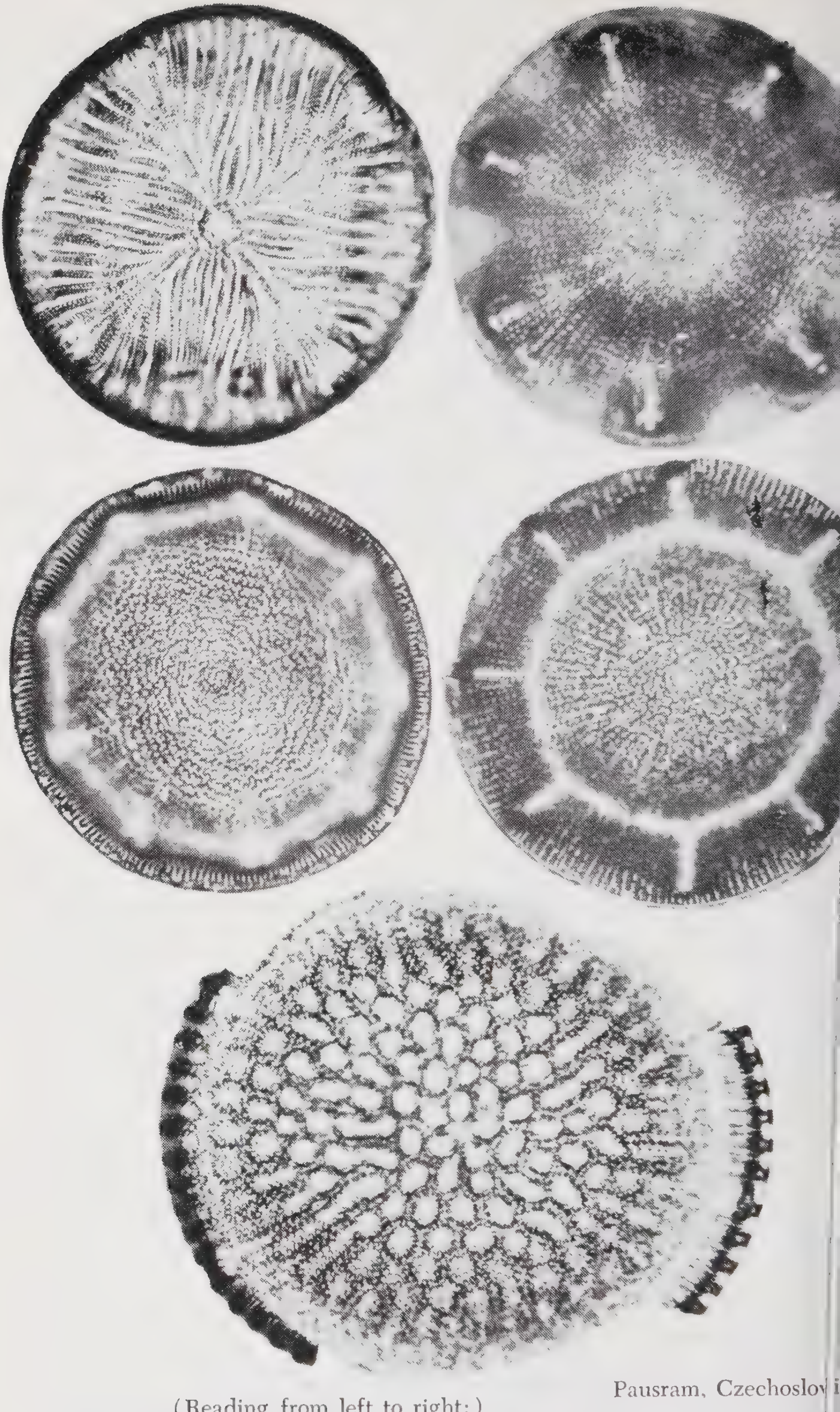
Summarizing the listings of Aulacodiscus, with suggested corrections, the flora of the locality of Augarten, near Brünn, would be:

A. *grevilleanus* Norman
A. *lunyacsekii* Pant.
A. *hungaricus* Pant.
A. *neogradensis* Pant.
A. *reticulatus* Pant.



Brünn, Czechoslovakia.

ulacodiscus grevilleanus Norman ex Greville (*A. grunowii* Cleve) in "The urnal of the Quekett Microscopical Club," Ser. II, Vol. 2, pl. 12, f.1. 1885.



Pausram, Czechoslov i

(Reading from left to right:)

TOP: 1. *Aulacodiscus gutwinskii* Pantocsek. .155 mm.

2. *Aulacodiscus hungaricus* Pantocsek. .168 mm.

MIDDLE: 3. *Aulacodiscus lunyacsekii* Pantocsek. .150 mm.

4. *Aulacodiscus neogradensis* Pantocsek. 168 mm.

BOTTOM: 5. *Aulacodiscus reticulatus* Pantocsek. .220 mm.

POUZDRANY (PAUSRAM)

About forty years ago another sample of Moravian earth became available to collectors, probably through Chenevière. The locality was known earlier, at least since 1909 when Pantocsek named *A. gutwinskii* from Pausram. This material has been searched by various workers including the late S. H. Meakin, by A. L. Brigger, R. Gosden, E. C. P. Bone and W. E. Flint. The following species have been found.

A. gutwinskii Pant.
A. lunyacsekii Pant.
A. hungaricus Pant.
A. neogradensis Pant.
A. reticulatus Pant.

A. grevilleanus Norman was not found, even in fragmentary form.

A. gutwinskii Pant. was described by him in *Verh. Ver. Natur- & Heilk.* Pressburg 29 (Neue Folge 20): pl. 1, f. 1, (1909) from Pausram, Moravia.

The name and description by Pantocsek had escaped the notice of diatomists until attention was called to them by R. Ross, of the British Museum (Natural History), in 1965. (See Joseph F. Burke and John B. Woodward, *A Review of the Genus Aulacodiscus*, p. 55, July 12, 1965. Published by the Staten Island Institute of Arts and Sciences.)

A. gutwinskii Pant. occurs with three, four, or five processes. In addition to the commonly used *Thumia elegans* it received the name of *A. splendidus*, when illustrated by F. Hustedt, in the *Atlas der Diatomaceenkunde*, pl. 464, f. 1 and 2, September 1958, from Pausram.

Thumia elegans Cleve was discussed by Frederick Beatson Taylor, in *Notes on Diatoms*, p. 228, published in 1929. Thum had prepared slides of this diatom which bore the unpublished name by Cleve. This name was accepted by Lefébure and Chenevière in *Bull. Soc. Fran. Micr.* 7:11 1/4 1938. It was used by S. H. Meakin, on a slide dated Nov. 1945, in the J. B. Woodward Collection.

Two incomplete valves of *A. reticulatus* Pant. found by Dr. Brigger would seem to validate the interpretation of Schmidt's f. 1, on pl. 92, *Atlas der Diatomaceenkunde*, from Brünn, as this species.

Staten Island Aphids

by Edwin Rundlett

It is doubtful if any other insect is as widely and thoroughly detested as the common aphid, or plant louse. Some people might consider that body lice, bedbugs, or cockroaches have earned that distinction, but in sheer weight of numbers the aphid exceeds these others.

The great English scientist, Thomas Henry Huxley (1825-1895), estimated that from the uninterrupted breeding of ten generations from one individual aphid there would result a mass of organic matter equal to the bulk of 500,000,000 human beings. A peculiarity of the insect's life cycle accounts for this prolificacy. Many, but not all, aphids spend the winter in the egg stage. From each of these eggs there hatches in spring what is known as the "stem mother." She begins producing living young when only two or three days old, bringing forth from two to seven daily, each of which in turn begins to produce living young in about eight days. In the south, and indoors in the north, this sexless reproduction of females can go on indefinitely. In our climate, true males are produced in the fall, in the open, where sexual unions take place.

There is variation in the life cycles of different species of aphids, but the short life cycles in every case accounts for the great numbers of almost defenseless individuals. They neither bite nor sting, and if you unconsciously eat some on your green vegetables neither taste nor smell would warn you and no harm would come to you, much as you may detest them.

The world-wide abhorrence by people for aphids is understandable because these insects are so harmful to the plants on which they feed by sucking sap, consequently reducing or destroying the beauty of flowers and the market value of fruits and vegetables. All of their food consists of plant sap. In order to get sufficient protein for body growth, they must suck up a vast amount of this slightly sweet water. The excess is given off through the anus in

the form of droplets of honeydew, which coats foliage and fruits below, attracting many species of ants and related insects that feed upon it. Ants even transport aphids to new feeding grounds and protect them against enemies. Colonies of microscopically-sized aphids, otherwise unseen, can be located by observing the attending ants.

At least twenty different virus diseases of plants are transmitted from plant to plant by means of the saliva injected while aphids feed. Just as serious to the local gardener is the sooty mold which deevlops on all surfaces of plants or furniture which may become coated with honeydew. This same exudant causes carefully polished automobiles to become sticky when parked under aphid-infested street trees.

I became involved in aphid study through the inspiration of Dr. Mortimer D. Leonard whom I first met while I was student of entomology at Cornell University. He has held many positions in colleges and in industry since then, all involving insect research and writing. Presently he is a Collaborator for the United States Department of Agriculture in Washington, D.C.

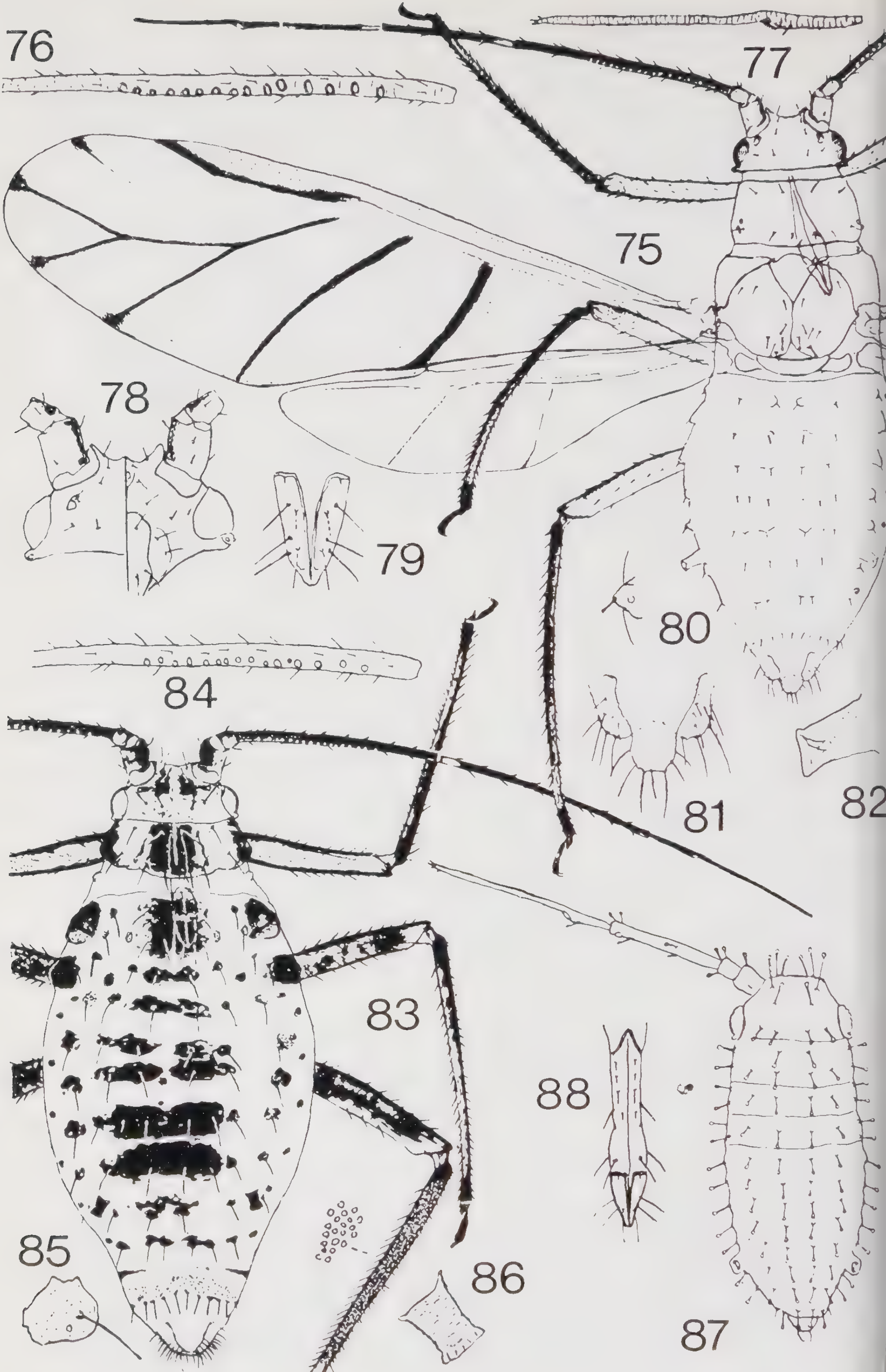
So difficult is the identification of aphid genera and species that few entomologists attempt it. Even Staten Island's most noted naturalist, William T. Davis, by-passed aphid study.

Dr. Leonard's most recent efforts have been the publishing of an exhaustive list of Aphids of New York. From the fall of 1960 to the summer of 1973, I collected intermittently to enable him to include Staten Island in that listing. My report is included in Volume 24, Nos. 1-4 (January 1974), COOPERATIVE ECONOMIC INSECT REPORT, issued by the U.S.D.A. A copy may be inspected at the Library of the Staten Island Institute of Arts and Sciences by permission of the librarian. My slides, produced by Dr. Leonard, went to the Cornell University collections for student research.

Of the 73 species of aphids known to occur on Staten Island, my collections included 72. Of these, eight have not been found elsewhere in New York State. There follows a list of these eight and an indication of where they occur outside of this state, according to Dr. Leonard's research.

Aphis knowltoni Hottes & Frison. Found on dandelion in New Dorp, the only record in this state. Found elsewhere in Illinois, Utah, Colorado, and Idaho, also on dandelion.

Calaphis leonardi Quednau. Found in High Rock Park on gray birch. New to New York. This species was named after Dr. Leonard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by Dr. F. W. Quednau in his honor. He had discovered it and described it as found on gray birch in Haddonfield, New Jersey. It has also been reported on that tree species in Massachusetts and in New Brunswick and Quebec in Canada.

Drepanaphis saccharini Smith & Dillery. Found in Castleton Corners on silver maple. New to New York. Reported elsewhere in Minnesota, Illinois, Kansas, Maryland, North Carolina; also on maple.

Dysaphis crataegi (Kaltenbach). Collected on Staten Island by the Special Survey of Ports of Entry in 1943. This was thought to be the earliest and only occurrence in the United States, but more recently a slide has been found of a collection in Washington, D.C. in 1915. It has also been collected since then in Maryland, New Jersey, Washington, and Oregon, all on carrot roots.

Myzocallis ephemerata Richards. Clove Lakes Park on red oak. Has been found also on oak in Ontario, Canada.

Myzocallis tuberculata Richards. High Rock Park on white oak. Widespread in eastern North America on oaks.

Pleotrichophorus glandulosus (Kaltenbach). Clove Lakes Park on common mugwort. Not common except locally, but also occurs in California, Washington, D.C., New Jersey, Pennsylvania, and Virginia on the same species.

Takecallis arundinaria (Essig). Clove Lakes vicinity, the area now occupied by the Staten Island Zoo parking lot. Two winged specimens captured on goldenrod in July 1969, probably transients to or from a nearby planting of hardy bamboo. An old actors' home had been demolished a few hundred feet away. Common and widespread on bamboos in California. A single collection has been recorded in Oregon, which raises a question as to how this originated.

It is probable that there are well over 200 species of aphids on Staten Island, such good hitchhikers are they.

It would pay everybody interested in plants to know the enemies of plants better. That was my objective in this search.

January 1974

(From *The Canadian Entomologist*. V.103:p.1097)

WINGED AND WINGLESS FORMS OF THE APHID *Calaphis leonardi*

Figs. 75-88. *Calaphis leonardi* n. sp. Types. 75-82, alate vivipara. 75, body. 76, IIIrd antennal segment. 77, VIth antennal segment. 78, head. 79, apical rostral segment. 82, cornicle. 83-86, ovipara. 83, body 84, IIIrd antennal segment. 85, lateral abdominal sclerite. 86, cornicle. 87-88, first instar. 87, body. 88, rostrum.

LNG TRANSPORTATION AND STORAGE: RELATIVE RISKS, HAZARDS AND ALTERNATIVES

A study prepared by

MICHAEL E. KRESS, GEORGE J. VACHTSEVANOS, and
BRIAN P. LEONARD

INTRODUCTION

This paper summarizes the investigations of scientists and engineers at Richmond College of The City University of New York, Staten Island, on the problems of liquified natural gas (LNG) transportation and storage. These investigations are based on experimental and statistical studies carried out by government agencies and private concerns. The published reports are listed in the appendix.

During the past few years, federal and local authorities have been attempting to define an appropriate national policy with regard to energy resources by evaluating both the nation's needs and the attractiveness and disabilities of various sources of supply. LNG has only recently become an attractive fuel and the new technology associated with its transportation and storage requires careful regulatory agency supervision.

Historically, LNG became an issue of critical importance to millions of citizens living in the Staten Island-New York City-New Jersey region during the year 1967 when the New York City Board of Standards and Appeals granted a variance over the objections of the Fire Department and the Department of Ports and Terminals allowing TETCO to build a 600,000 barrel LNG tank in Bloomfield, Staten Island. By 1970 TETCO was receiving LNG shipments to its Staten Island terminal. By June 1970 Distrigas Company announced its intent to construct nine 600,000 barrel tanks for liquified natural gas in Rossville, Staten Island and initiated steps towards securing certification for various aspects of the project. In February 1973 an explosion and fire in the Bloomfield facility killed 40 persons. The Federal Power Commission, reversing an earlier decision, agreed to exercise jurisdiction over the facilities. On September 6, 1973, the Commission issued for comment its draft environmental impact statement relating to the Staten Island facilities. The Commission study was the first step in a detailed analysis of the Staten Island complex and its effect on human safety and the environment. It set forth several important problems relating to the construction and operation of these facilities. State and Federal agencies and interested members of the public were invited to bring reasoned debate to the issues of alternative sites, safety and other substitute energy sources. Soon thereafter, the FPC initiated hearings on

Distrigas' application and in June 1974 the Commission's staff issued the final Environmental Impact Statement for the Construction and Operation of an LNG Import Terminal at Staten Island, New York. This statement termed the risk of transporting and storing LNG on Staten Island "acceptable" and set the stage for the Richmond College study.

We have been primarily concerned with: What is the risk of an accident? What is the probable result of an accident? How does the risk of an LNG accident compare to other risks? Alternatives to storages of LNG on Staten Island.

A risk analysis associated with the dangers of LNG storage and transportation proves that an accidental event will be of catastrophic proportions. Further, the probability of occurrence of an LNG accident is greater than the probability of occurrence of a similar multiple-fatality event due to the total of all possible causes (excluding nuclear war). Moreover, off-shore storage facilities provide a viable alternative, thus eliminating exposure of a densely populated area to an unacceptable risk.

RISK ANALYSIS

An interpretation of the best available technical information would involve the following methodological steps:

a) Given the spill and meteorological or geological conditions, a relative degree of *hazard* may be assigned to various spill and meteorological configurations. These configurations would correspond to LNG spills due to operator error, damage to one tank of the vessel, chain-reaction rupture of entire vessel following damage to one tank, rupture of entire vessel, transfer pipe break, etc. and meteorological conditions corresponding to various stability classes. The relative hazards are estimated and summarized below for the New York port and Staten Island areas.

b) A relative index of exposure may be assigned on the basis of available information on LNG transportation routes, transfer and storage facilities, and

c) The most difficult task of determining the probability of any of the specific hazards occurring under various exposure conditions. The information presently available is incomplete and its interpretation focuses on the wrong problem.

d) Finally, the total risk equation would equate the risk or threat to the product of the probability of occurrence times the danger or severity, i.e.,

RISK (or THREAT) = (PROBABILITY OF OCCURRENCE) x (DANGER)

where:

DANGER = (HAZARD) x (EXPOSURE)

The available evidence shows this risk for Staten Island and the New York port area to be very real and substantial. The hazard analysis, which follows, substantiates this point.

HAZARD ANALYSIS

We have analyzed the extreme hazards to which the local population of Rossville would be exposed as well as the reckless dangers threatening a vast number of people in the New York Metropolitan area which would result from the use of the Distrigas facilities.

On a local scale, a minor accident causing an LNG discharge of 200 gallons per second could transform the peaceful residential area of Rossville into a charred death valley. A flow rate of 200 gallons per second is conservatively realistic, corresponding to total rupture of an eight-inch diameter inflow pipe. A typical inflow at Distrigas' Rossville facility is 30 inches in diameter with a flow rate of 716 gallons per second. Accordingly, a flow of 200 gallons per second is less than one-third the flow resulting from rupture of an unloading pipe at Rossville.

According to a report on the hazards of LNG spills by the Bureau of Mines in September 1972[6], the distance to the *lower flammable limit* from a discharge of 200 gallons per second for a period of 10 minutes under 99% of all atmospheric conditions would be *at least* 4,000 feet. Applying this 4,000-foot flammable range to the Rossville site results in an extremely hazardous threat to the 14,000 residents (based on 1970 Census data) in the immediate exposure region, including:

1) The Arthur Kill Rehabilitation Center with its 1,000 daily population, located approximately 1,000 feet from a tank;
2) John Quinn (a long-time resident of Rossville) and his family, located within 700 feet of a tank;
3) Over 100 residents of Rossville along Arthur Kill Road, located 1,000 feet from a tank;
4) The over 200 residents of Barry Street and St. Luke's Avenue, located within 2,000 feet of a tank;
5) The 3,000 potential residents of the new housing development being built by Kaufman and Broad Homes, Inc., located 3,000 feet from a tank.

It is important to emphasize that a spill size of 200 gallons per

second is a conservative one, and that adverse atmospheric weather conditions would cause the range of flammability to be much greater than 4,000 feet. Such a ground-based cloud would inevitably be trapped and ignited in the valley. The results would be devastating. The danger is so great that a special Pre-Fire Plan for Distrigas at Staten Island has been drafted by the New York City Fire Department.[10] The first strategy is to evacuate endangered personnel and the second alarm unit shall be assigned to evacuation of civilians. Sic: A layman might question this order of priority inasmuch as the personnel have voluntarily accepted this risk and are compensated accordingly yet the local civilians have had it forced on them without compensation.

In addition to a spill caused by rupture of an inflow pipe, there is the probability of a tanker collision or grounding. An accident of this nature would result in an instantaneous spill of 25,000 barrels, a small part of the total load. Calculations carried out by the Esso Research and Engineering Company[7] on a spill of this size, indicate that the ground-level horizontal extent of the vapor trail to the lower flammable limit, under stable atmospheric conditions, would be 21,000 feet or approximately 3.5 miles. This accident could occur at Rossville or en route to Rossville, thereby exposing 168,000 residents to the devastation of a giant incendiary cloud (based on the Federal Power Commission (FPC) Final Impact Statement,[9] July 1974).

In addition to tanker transport into Rossville, local barge transport within New York harbor is also proposed. According to the FPC (July 1974), ". . . the vapor cloud resulting from a 5,000 cubic meter barge spill would extend to 4,500 feet (approximately 1 mile) downwind of the spill." A spill could occur at any point along the LNG tanker approach or along the LNG barge delivery routes. These routes expose a vast area including sections in New Jersey, Brooklyn and Manhattan, as well as Staten Island. The total number of residents exposed to perils of an LNG barge accident is 807,000 persons according to the FPC. With every movement of an LNG barge, the life and property of nearly a million residents of the Metropolitan area would be placed in extreme danger.

By implication, the FPC estimates an average of more than 40,000 fatalities resulting from a LNG barge collision. In its Final Impact Statement, the FPC calculates the probability of death from an "undesirable LNG event" for an individual living within the "area of concern" to be 1/7600 over a 10 year period. This is based on an estimated probability of occurrence of such an event

of 1/400 in 10 years and the ratio of average fatality area to total exposure area of 1/19.

The FPC Impact Statement compares their estimated ten-year span LNG death probability with corresponding figures for common mortal diseases and accidents (including those of motor vehicles). The figures (a probability of death of 1/10 in ten years from any of the common causes) imply that the LNG threat is practically insignificant and reasonably tolerable. However, due to the catastrophic fatality scale involved (and the additional associated injury and property damage), an LNG disaster of this type should be compared not with causes affecting isolated individuals, but with other multiple fatality events of natural or anthropogenic origin. (The FPC statement mentions that this aspect is ". . . probably regarded by many persons as considerably worse . . .," but does not pursue this line of argument further.)

For example, a recent study by the U.S. Atomic Energy Commission (AEC) compares a number of multiple-fatality events (in relation to the question of nuclear power plant safety). From the AEC's graph of estimated frequency of occurrence *vs* number of fatalities per event, it can be inferred that the FPC's estimated frequency of 1/400 per ten-year period (i.e., 1/4000 per year) of an "undesirable LNG event" claiming, on the average, 42,474 lives would be of comparable significance to the *total of all other causes* (excluding nuclear war). Clearly, this is an extremely sobering comparison.

The decision to impose a threat of this magnitude on the residents of one of the world's greatest cities is a very grave one. It is totally out of the question when one realizes that far safer alternatives (such as off-shore storage and conventional gas pipelines) are available. The argument of short term financial benefits to the parties concerned (and, presumably, to the consumers) is irresponsible in the extreme when one considers the sheer gravity of the situation.

ALTERNATIVES

The scientific evidence points to a totally unacceptable solution to the problem of transporting and storing LNG on Staten Island as offered by the liquified natural gas industry and corroborated by the Federal Power Commission through its Environmental Impact Statement. The FPC statement reaches conclusions by misinterpreting scientific data and omitting certain evidence particularly as it relates to alternative sitings and techniques.

We are of the firm belief that a viable and constructive alternative to on-shore storage of LNG and other hazardous materials exists: *off-shore terminal systems.*

Extensive studies[12-15] have been conducted in the past four years on the technoeconomic feasibility and environmental impact of deep water terminal structures.

Soros Associates[14] in a four-volume report describe a thorough study of off-shore terminal system concepts conducted under contract with the U.S. Department of Commerce, the Maritime Administration. In this exhaustive study import commodities such as petroleum, LNG, coal and ore (for which the economy of movement in supersize ships would justify the construction of deep water terminal facilities) have been analyzed; the benefits and limitations of multi-use terminals have been evaluated and specific environmental protection features defined; deep water sites suitable for deep water terminal construction have been surveyed in the New York and New Jersey areas; conceptual designs for representative sites and comparisons of capital and operating costs of alternative systems are included in the Soros investigation.

From a technical standpoint, practical types of construction as well as the equipment and methods which could be used to build off-shore terminals have been determined, and currently available pollution prevention and control devices have been reviewed. This information was used as a basis for the conceptual designs prepared for the representative sites.

Construction cost estimates have been made available for the various stages of development at each of the sites in order to determine the capital cost requirements, annual costs and "breakeven" transfer charges.

The study establishes that the most desirable type of connection between an off-shore terminal and on-shore distribution facilities, from the economic and environmental points of view, is a pipeline.

The Soros study concludes that ". . . environmental considerations suggest that modern terminals at off-shore sites can offer significantly less potential for environmental damage and, all things considered, would be a step toward improving present conditions."

The Soros Associates' study clearly establishes the technical and economic justifications for the construction and utilization of deep water LNG storage facilities. The evidence suggests that a properly designed and operated off-shore terminal could greatly reduce environmental hazards.

A thorough and complete study of off-shore multi-use terminals is necessary and essential. The potential risk to human life from transporting and storing LNG on Staten Island should be providing the most sufficient and convincing argument for such a step by the proper authorities.

CONCLUSIONS

We find the concentration of this enormous risk to a small percentage of the consumer population totally unacceptable. We are strongly urging the Federal Power Commission to consider the alternatives: The storage of LNG in off-shore terminals would eliminate exposure to potential hazards and result in a more equitable distribution of benefits and costs.

APPENDIX

1. "Unusual Fire Hazard of LNG Tanker Spills," Fay, James A., Combustion Science and Technology, Vol. 7, 1973
2. "Cold Cargo," Fay, James A., Environment, Vol. *14* #9, Nov., 1972
3. "Study Downwind Vapor Travel From LNG Spills," Parker, Robert O., American Gas Association, Operating Section Distribution Conference, 1970
4. "LNG Importation and Terminal Safety," Proceedings, National Academy of Sciences, 1972
5. "Hazards Associated With the Spillage of Liquified Natural Gas on Water," United States Department of the Interior, Bureau of Mines, 1970
6. "Hazards of Spillage of LNG Into Water," United States Department of the Interior, Bureau of Mines, 1972
7. "Spills of LNG on Water-Vaporization and Downwind Drift of Combustible Mixtures," Esso Research & Engineering Company, 1972
8. "Draft Environmental Impact Statement," Federal Power Commission, Bureau of Natural Gas, August, 1973
9. "Final Environmental Impact Statement for the Construction and Operation of an LNG Import Terminal at Staten Island, New York," Federal Power Commission, Bureau of Natural Gas, July, 1974
10. "Pre Fire Plan Distrigas (DONY) Staten Island," New York City Fire Department, 1974
11. "An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," WASH-1400 U.S. ATOMIC ENERGY COMMISSION, August, 1974
12. "Foreign Deep Water Ports Developments." A report to the U.S. Army Corps of Engineers, Arthur D. Little & Co. 1971
13. "Deep Water Needs of the United States." A report to the U.S. Army Corps of Engineers, Robert R. Nathan Associates. 1972
14. "Offshore Terminal System Concepts" (4 Volumes). A report to the U.S. Department of Commerce, Maritime Administration, Soros Associates, Inc. 1972
15. "Ecological Effects of Offshore Construction," Rounsefell, George A., Journal of Marine Science, Alabama, Volume 2, Number 1, 213 pages, 1972

COMMUNICATIONS

Chuck-Will's-widow: Newcomer.

Miss Susan Kerber, age 22, living in Pleasant Plains, Staten Island, is a highly competent birder. It was Miss Kerber who discovered a Chuck-Will's-widow *(Caprimulgus carolinensis)* on Staten Island on the night of May 18, 1974, notwithstanding that she had never before had first-hand experience with this southern bird. To the best of our knowledge, the species had not occurred on Staten Island previously. The most northerly breeding locality for the Chuck-Will's-widow, according to the literature, appears to be Cape May County in extreme southern New Jersey.

In November 1973, while visiting in Columbia, capital of South Carolina, Miss Kerber went to the museum in that city. One of the exhibits was a cabinet containing several pictures of birds. On the outside of the cabinet were push buttons, each one relating to one of the bird pictures contained in the cabinet. By pushing a selected button, the visitor then heard a tape recording of the song or call of the bird chosen. One of the buttons pushed by Susan was that of the Chuck-Will's-widow. How well she listened to that recording became evident when, six months later, from her home on Penton Street in Pleasant Plains, Susan one night heard in the distance a bird call which was an exact duplicate of the recording she had played in the South Carolina museum. Without hesitation, Miss Kerber followed the railroad tracks from Pleasant Plains toward Richmond Valley in order to make a closer study of the bird's vocalization. Thus the Chuck's whereabouts were traced to a woodland just south of Station Avenue at its junction with Drumgoole Boulevard, actually in Pleasant Plains. The bird made this bit of woodland its headquarters from the date of its discovery until July 7th, the date on which it was last heard to call.

The presence of the avian rarity on Staten Island was at once made known to the so-called "Rare Bird Alert," an arrangement by which those interested can call a certain telephone number in New York City and listen to a taped recording telling of rarities observed in or near the city within the past few days. Our Chuck-Will's-widow was an accommodating bird, remaining dependably in the same patch of woods from which it nightly sent forth its

loud, repetitious call, beginning soon after dusk toward nine p.m. and sometimes continuing until three a.m. This writer made an excellent tape recording of the Chuck's call notes, as did at least two other members of the Staten Island groups visiting the site. At least one birder came from off-island to observe the bird.

By the use of an electric flashlight it was possible to catch a momentary glimpse of the Chuck as it perched on a tree branch or atop a dead stump, and to cause its large eyes to shine with a golden glow in reflecting the beam of light. In pursuit of flying insects, the bird could rarely be seen on the wing above the tree tops, its silhouette conspicuous against the sky glow produced by the lights along the nearby parkway.

It seems odd that in nature there are two birds in some ways closely similar, as if one were a slightly altered model of the other, these birds being the Chuck-Will's-widow and the Whip-poor-Will. The Whip-poor-Will has long been a summer resident and breeder on Staten Island, occurring regularly in Sandy Ground (Woodrow), Pleasant Plains, Richmond Valley, and other localities. On any evening in early summer—beginning in late May and continuing through June and July—even the poor listener cannot help but hear this bird's persisent broadcast, the phrase being repeated as many as seven or eight hundred times without pause. William T. Davis interpreted this bird's call as "Purple-rib," not "Whip-poor-Will."

The Whip-poor-Will (*Caprimulgus vociferus*) is nine to ten inches in length; the Chuck-Will's-widow measures from eleven to thirteen inches in total length. The Whip-poor-Will has a black throat; the Chuck's throat is brown. Both birds have checkered plumage consisting of brown, black, and white feathers, the Chuck tending to be browner than the Whip-poor-Will. The greatest contrast between the two species occurs in the vocal performances. The Whip-poor-Will has a call of three syllables, the Chuck-Will's-widow's call consists of four. The "Whip" utters its calls in rapid sequence with no pause whatsoever, whereas the "Chuck" consistently allows a spacing of about two seconds between calls. Neither bird makes a nest, the two white eggs with faint spottings being deposited on the ground where it is strewn with dead leaves.

Careful observers are given to stressing the large size of the Chuck-Will's-widow's mouth, measuring as much as two inches from corner to corner, fringed by long stiff bristles, and whose basal half "is grown with *hairlike branches*," to quote Dr. Frank M. Chapman. He further states: "For this reason it can swallow large objects with ease, and both Hummingbirds and Sparrows

Dennis Schneider

CHUCK-WILL'S-WIDOW

(Caprimulgus carolinensis)

The above photograph was taken of a mounted specimen in the collections of the Staten Island Museum.

have been found in the Chuck-Will's-widow's stomach. Possibly they were mistaken for large moths, but Gerald Thayer records a Chuck-Will's-widow which, following a steamer off the Carolina coast, was seen to pursue and catch Warblers on the wing." (*Auk*, 1899. pp. 273-276)

HOWARD H. CLEAVES
Staten Island, New York

September 1974

New Information on Diabase Sill

Up to the time of the construction for the West Shore Expressway, the outcrop of diabase in the swamp near Travis Avenue and Victory Boulevard at the William T. Davis Wildlife Preserve was considered to be the furthest known location of the sill at the Staten Island end.

During 1974, however, according to Senior Civil Engineer Frank N. Gallo of the New York State Department of Transportation, the western edge of this diabase was found to have penetrated some 6,000 feet further southwest. In building bridge abutments by excavation 1,500 feet south of the intersection of Victory Boulevard and the West Shore Expressway at Wild Avenue (see Staten Island Quadrangle: location S 24,412 feet and W 41,901 feet), diabase was again encountered at elevation zero.

Two samples of the diabase described here have been deposited in the Museum's rock and mineral collection.

RUDOLPH LINDENFELD
Staten Island, New York

September 1974

Sketch map of location at which diabase was encountered; inset map shows location in relation to rest of Staten Island.

BOOKS RECEIVED

Butterflies of Staten Island. Arthur M. Shapiro and Adrienne R. Shapiro. Published by *The Journal of Research of the Lepidoptera*, California. Illustrated. 1973. $2.50

Sub-titled "The ecological associations of the butterflies of Staten Island," a statement is included on the climatological and phenological aspects of the year 1971, as well as an annotated list of species. An important addition to the library of local naturalists as well as entomologists.

Insects in Flight. Werner Nachtigall. Published by McGraw Hill Book Co. Illustrated. 1968, translation 1974. $13.95

All the current knowledge on insect flight, from the fields of biophysics and other sciences, has been assembled for the first time in this volume. Dr. Nachtigall provides a complete and authoritative discussion of how insects fly. He has attempted to interweave chapters of essential factual matter with more recreative ones. Every important principle and technique in the field of insect flight is explained in terms that can be understood by the general reader.

The Cheetah: The biology, ecology, and behavior of an endangered species. Randall L. Eaton. A title in the "Behavioral Sciences Series" published by Van Nostrand/Reinhold. 1974. $12.95 Illustrated.

The ability to maintain and preserve endangered species depends upon our knowledge of the endangered animal's needs. This book is an in-depth research of one such animal—the cheetah—and as such is a first. The author describes in detail all aspects of cheetah life history, reproduction, ecology, captive management, ethology, conservation. Some of the author's finding with regard to the complexities of communication between and among cheetahs are revealed for the first time. He discusses little known aspects of the social life and hunting methods of competing predators. As a study in aggressive behavior and predatory drive, it is invaluable. The photographs are especially appealing.

The Horizon Book of Vanishing Primitive Man. Timothy Severin. Illustrated. American Heritage Press. 1974. $22.00.

This large-format book, copiously illustrated with much of it in color, is a reader's journey in search of the living survivors of Stone Age societies. It explores the history and present circumstances of ten primitive peoples, and along the way, tells the stories of many of civilized man's most exotic adventures: his first wary, mutually amazing meetings with utterly different cultures. Each chapter combines the accounts of explorers whose records form the basis of our knowledge of a primitive people with the latest insights of modern anthropologists. The book's narrative is by historian Timothy Severin, a Fellow of the Royal Geographical Society. Colin M. Turnbull, the anthropologist who is noted for his definitive studies of the "Forest People" and the Iks of central Africa, has served as consultant for the book.

Farm Town: A Memoir of the 1930s. Photographs by J. W. McManigal. Edited, and with text and additional photographs by Grant Heilman. The Stephen Green Press. 1974. $12.95 cloth; $7.95 paper.

Most of the photographs were taken by J. W. McManigal in and around Horton, Kansas, between 1935 and 1940. Farming there was much the same as it was elsewhere in the nation—subsistence farming during the hard times of the Great Depression just before modern large-scale specialization ended that way of life. The photo-

graphic record of the past often serves as the historic documentation of the period, for in no other way is it possible for many people to taste the flavor of other days.

History Preserved: A Guide to New York City Landmarks and Historic Districts. Harmon H. Goldstone and Martha Dalrymple. Simon and Schuster. Illustrated. 1974. $12.95.

"Architecture is a physical fact; history happened in actual places. We hope this book will stimulate the reader to explore the city on foot, to seek out and examine the many vestiges of its great and enduring past, and to acquire a discriminating and appreciative view of this heritage." The preceding is the authors' thesis. To aid this, each section is introduced by simple, clear maps, followed by many illustrations of the buildings and areas under discussion, and engagingly described in the text. The majority of the book is given up to Manhattan Island, but Staten Island, occupying the end of the book, is found to occupy the beginning of the chronological charts. Time has so far wreaked less vengeance upon the historic buildings of Richmond County, although many of us can think of buildings which we wish had been saved.

Mr. Goldstone, among others, was influential in the landmarking of the Sailors' Snug Harbor facade buildings and chapel. Several pages in this book are devoted to the history of the buildings and a recounting of the research supporting their designation as landmarks.

Museum Media. A biennial directory and index of publications and audiovisuals available from United States and Canadian institutions. Paul Wasserman and Esther Herman. Gale Research Company. 1972. $48.00.

Thousands of subjects are covered in the books, booklets, exhibit catalogs, films, and other media which are available for sale or distribution by museums, galleries, art institutes, and similar organizations. Yet, access to these significant materials has been severely hampered because there has been no comprehensive, detailed directory to this vast field of information. Now this need has been uniquely met by this publication.

Environment U.S.A. A Guide to Agencies, People, and Resources. Glenn A. Paulson. A Bowker Publication. 1974 $15.95.

This is the first work to compile, organize, and summarize the many diverse environmental activities going on in the United

States today. Written both for professionals and laypeople who have virtually any type of environmental problem or question, it is a uniquely practical guide to the appropriate sources of information, knowledge, and help.

ABOUT OUR CONTRIBUTORS

Joseph F. Burke and *Warren E. Flint* have devoted many years to the study of diatoms. Both are members of the New York Microscopical Society and both are past-presidents. Their business backgrounds have been finance and precision instrumentation respectively.

Howard H. Cleaves is one of Staten Island's best-known naturalists and ornithologists. He has worked professionally as a lecturer and filmmaker. on natural history subjects for Audubon Society and other organizations. He is a Life Member of the S. I. Institute of Arts and Sciences.

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Brian P. Leonard is an Associate Professor of Engineering Science in the Division of Pure and Applied Sciences, Richmond College of the City University of New York. He received his B.M.E. from the University of Melbourne, Australia, and his M.A.E., Ph.D., from Cornell University.

Rudolph Lindenfeld has been a teacher most of his life. His field has been languages but since the opening of the program of class-lectures at High Rock Park Conservation Center in 1965 he has been a regular lecturer in the earth sciences and biology.

Edwin A. Rundlett received his B.S. degree from the N.Y.S. College of Agriculture and gained his practical experience working on farms. Although beset with progressive deafness early in his career, a condition which did not improve, he has had a successful and productive working life as arboriculturist and later horticulturist for the City Parks. He retired in 1961 and has continued to keep busy writing a weekly column of gardening advice in the local newspaper as well as indulging in investigations such as he writes about in this publication. He is a Fellow of the S. I. Institute of Arts and Sciences.

George Vachtsevanos received his Bachelor's degree in Electrical Engineering from C.C.N.Y. in 1962 and his Master's degree from N.Y.U.; his Ph.D. in Engineering was awarded by the City University of New York. He has taught at City College, N.Y.U., and Manhattan College and currently is an Assistant Professor of Engineering Science at Richmond College. He is a member of the Institute of Electrical and Electronic Engineers; the Water Pollution Control Federation; the Hudson River Enviromental Society; the Systems, Man, and Cybernetics Society.

PROCEEDINGS
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Articles

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:ACODISCUS SPECIES OF SAINT-LAURENT FLORA

Joseph F. Burke and Warren E. Flint

: diatoms of the fossil marine deposit at Saint-Laurent- -Vernède, Gard, France, were dealt with in an article by Lefébure in the *Bull.Soc.Fran.Micr.*,4:44-57,pls.3&4,1935. There was some confusion in the treatment of the species Aulacodiscus by Lefébure, with lack of uniformity of :lusion in the text, in the list, and in the plates. This ; discussed in *A Review of the Genus Aulacodiscus*,)lished by the Staten Island Institute of Arts & Sciences, 222, January 10, 1969, and p.309, October 28, 1970.

The following is a revised list of the species of lacodiscus that have been found to occur in this deposit:

A.grevilleanus Norman	*A.hungaricus* Pantocsek
A.habirshawii Pantocsek	*A.neogradensis* Pantocsek
A.lunyacsekii Pantocsek	*A.reticulatus* Pantocsek

A.grevilleanus appears in the list of the Lefébure article der the synonym *A.grunowii*. There is no figure and no mment in the text. A specimen, mounted by S.H.Meakin, is the John B. Woodward collection. It measures .198 mm. and 5 8 processes. Otherwise the species has not been countered in the present investigation.

A.habirshawii was not reported by Lefébure. This species 5 reviewed by F.C.Wise, in *The Journal of the Quekett croscopical Club*, ser.4, 3:285-286,pl.22,f.1,1951. It is arce in the Saint-Laurent deposit.

A.lunyacsekii seems to be common in the deposit and pears in the text, list, and plates of Lefébure, but termined incorrectly under the name, *A.amoenus*. His lustration is pl.3, f.2.

A.hungaricus appears under the names *A.subangulatus* and/or *subangulatus* var. *concentricus* in the text, list, and ates and *A.sparsus* in the list and plates. Illustrations cur on pl.3,f.3, and pl.4, f.14.

A.neogradensis does not appear in the article by Lefébu
Similar in structure to *A.hungaricus*, except that the
surface of the valve is depressed instead of domed, it ha
been postulated[1] that the two represent dissimilar valves
the same species, though here listed separately. Their
relationship to *A.pulcher*, of the California deposits, ha
yet to be resolved, though because of geographic separati
it is convenient to regard them as distinct from that
species. No report has been received of complete frustul
having been found displaying the dissimilar valves of
A.hungaricus/neogradensis or of *A.pulcher*. But in the ca
of *A.patens*, of the Oamaru deposits, New Zealand, unsepa-
rated frustules showing dissimilar valves have been found
Meakin, Rawson, and Bone.[2] A figure of an entire frustule
A.patens with dissimilar valves can be observed in *The
Journal of the Quekett Microscopical Club*, *ser.4*,5:192,f.
1959.

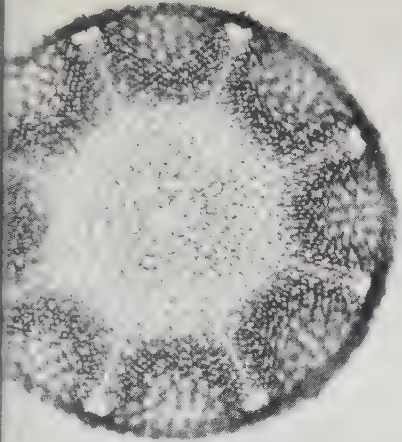
A.reticulatus appears in the text, list, and plates of
article by Lefébure and probably is the most frequent of
the Aulacodiscus species in the deposit. His illustratio
is pl.3,f.4. It is considered here that *A.haynaldii* of
Pantocsek is a denuded form of *A.reticulatus*.

A.janischii is reported in the text of the Lefébure
article, but the name does not appear in the list, nor is
illustrated. It is a species of the Oamaru deposits of N
Zealand, and it would seem not to belong in the Saint-
Laurent deposit.

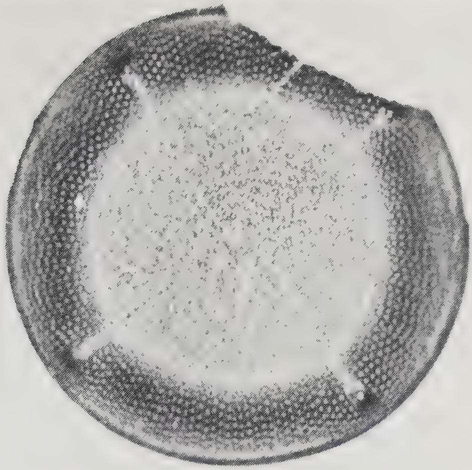
[1] Joseph F. Burke, *A Review of the Genus Aulacodiscus*, p.
October 28, 1970. Staten Island Institute of Arts &
Sciences.

[2] Ibid. p.302, October 9, 1970.

1. *Aulacodiscus grevilleanus* Norman ex Greville .198
2. *Aulacodiscus habirshawii* Pantocsek .200
3. *Aulacodiscus hungaricus* Pantocsek .115
4. *Aulacodiscus lunyacsekii* Pantocsek .262
5. *Aulacodiscus neogradensis* Pantocsek .153
6. *Aulacodiscus reticulatus* Pantocsek .230



1.



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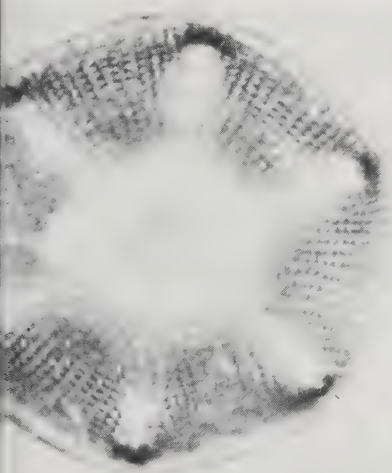

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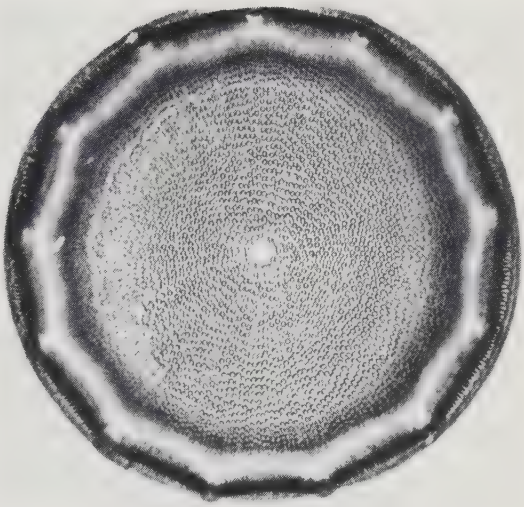

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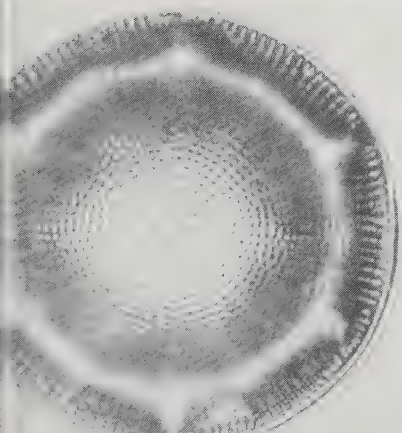

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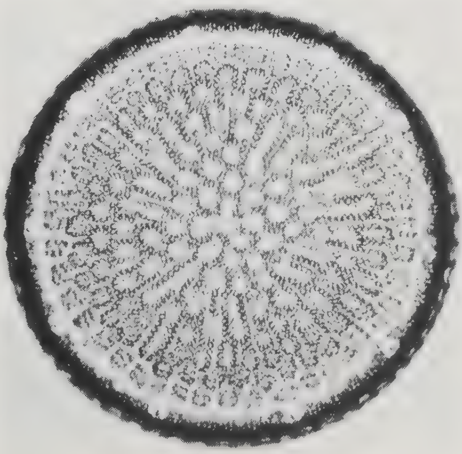

6.

BIRD COUNTS 1974-1975

by Mathilde P. Weingartner

Christmas Bird Count 1974: On December 22, 1974 twenty-s birders covered the fields, woods, beaches, and backyard feeders, as well as the Fresh Kills Landfill and the shor of the Kill van Kull and the Arthur Kill to observe a tot of 92 species of birds and 58,759 individuals.

The weather was partly cloudy, the temperature ranged f 36° to 41°, winds were northwest at 9 to 35 miles an hour There had been no freeze-up of any ponds or lakes and no snow before this count was taken. As a result many observers were disappointed because birds kept low out of reach of the gusty wind. Many feeders had not yet been stocked (with the price of bird feed doubling since the preceding year), therefore it was hard to find all the perching birds. However, different birds showed up in diverse areas, making up the variety of species, and the over-all count was quite satisfactory.

It was the first time that all three mergansers were reported. The sharp-shinned hawk and the merlin put in a rare appearance; a clapper rail was found for the first t in 20 years, a Swainson's thrush was seen for the second time only; killdeer, pheasant, and white-crowned sparrows were counted at an all-time high, and the count of 862 mourning doves was extremely high. A first for the count was the sighting of a northern yellowthroat by the Siebenhellers.

The observers were: Mrs. Anna Meyer, Charles Pearson, Fr. Henry Traub who scouted the southern part of the isla Susan Kerber and Howard Fischer covered Pleasant Plains, Princes Bay, Huguenot, including Wolfe's Pond Park; Mr. a Mrs. William Siebenheller and Vincent Cardinale were in Rossville, Charleston, and Greenridge; Robert Clermont, along the South Shore in Eltingville and Annadale; Willia Gibson, Henry Flamm, John Stonick, at Great Kills Park; M and Mrs. Philip Benjaminson worked inland from Great Kill to New Dorp; Miss Esther Brewer, Timothy Abraham, Elaine Kantor, and Gloria Deppe, at Emerson Hill, Todt Hill, Lighthouse Hill, and Buck's Hollow; Mrs. Celia Polomany, Mrs. Doris Barlow, and Richard Buegler, at Moravian, High Rock, Pouch Camp, and Richmondtown; Charles Fallon and T Materfis, at the Fresh Kills Landfill, Davis Refuge, and

›wbrook Park; Mrs. Lucy James, at Mariners' Harbor;
ırd Zain-Eldeen and Mathilde P. Weingartner covered the
ı shore of the island (including Sailors' Snug Harbor),
ı and Midland Beaches, Grasmere and Shore Acres Ponds,
Clove Lakes Park.

hroated Loon	1	Dunlin	7
ed Grebe	110	Sanderling	16
-billed Grebe	4	Great Black-backed Gull	6040
e-crested Cormorant	2	Herring Gull	23,232
Blue Heron	1	Ring-billed Gull	144
la Goose	5	Bonaparte's Gull	295
	5	Mourning Dove	862
rd	549	Screech Owl	2
Duck	1,117	Short-eared Owl	1
il	8	Belted Kingfisher	2
-winged Teal	300	Yellow-shafted Flicker	1
-winged Teal	1	Hairy Woodpecker	2
can Widgeon	26	Downy Woodpecker	48
Duck	1	Horned Lark	47
sback	10	Blue Jay	111
er Scaup	5,147	Common Crow	428
er Scaup	16	Fish Crow	6
n Goldeneye	151	Black-capped Chickadee	104
ehead	298	Tufted Titmouse	24
uaw	37	White-breasted Nuthatch	22
-winged Scoter	2	Red-breasted Nuthatch	1
Duck	5	Brown Creeper	2
d Merganser	4	Carolina Wren	2
n Merganser	3	Mockingbird	68
reasted Merganser	15	Catbird	1
-shinned Hawk	1	Robin	7
ailed Hawk	12	Swainson's Thrush	1
houldered Hawk	1	Cedar Waxwing	18
-legged Hawk	13	Starling	17,327
Hawk	7	Yellow-rumped Warbler	59
n	1	Yellowthroat	1
ow Hawk	18	House Sparrow	626
necked Pheasant	68	Eastern Meadowlark	1
er Rail	1	Redwing	231
eer	56	Common Grackle	6
Turnstone	20	Brown-headed Cowbird	39
n Snipe	19	Cardinal	105
r Yellowlegs	11	Evening Grosbeak	35
e Sandpiper	70	House Finch	40

American Goldfinch	20	White-crowned Sparrow	
Rufous-sided Towhee	1	White-throated Sparrow	
Savannah Sparrow	16	Fox Sparrow	
Vesper Sparrow	2	Swamp Sparrow	
Dark-eyed Junco	118	Song Sparrow	
Field Sparrow	1	Lapland Longspur	
Tree Sparrow	104	Snow Bunting	

Waterbird Count 1975: January 12, the day of the waterbi count for the State of New York, was a balmy, sunny day w the temperature rising into the 60s. All waterways were open and the waters of the bay were quite calm with littl wave action and no fog obscuring visibility. The count o waterbirds was as a result quite good.

The eight observers were Charles Fallon, Tom Materfis, Richard Buegler, Richard Zain-Eldeen, Mr. and Mrs. Siebenheller, Anna Meyer, and Mathilde Weingartner.

Some of the birds seen on the Christmas count were miss but others had increased in numbers.

Red-throated Loon	1	Canvasback	
Horned Grebe	210	Greater Scaup	4,
Canada Goose	4	Goldeneye	
Mallard	246	Bufflehead	
Black Duck	438	Oldsquaw	
Gadwall	2	White-winged Scoter	
Pintail	26	Ruddy Duck	
Green-winged Teal	2	Hooded Merganser	
Baldpate	4	Common Merganser	
Shoveler	13	Red-breasted Merganser	
		TOTAL	6,

First May Day Count, 1975: On May 17, 1975 twelve enthus astic birders, under the leadership of Mr. and Mrs. Willi Siebenheller, went afield from 5 a.m. (looking for owls) until 10:30 p.m. (finding a Chuck-Will's-widow).

This was the first organized attempt of this sort on Staten Island, although Henry Flamm had been active alone for several years and has chalked up as many as 97 specie on one day.

Although the weather was cooperative, it did not seem t be the day for waves of warblers to fly in, settle down f the day and feed, and be available to be counted. Instea

as hard work to find the 130 species recorded on this .

ere were a number of rare species on the list: snowy ts and little blue herons seemed to have arrived early; on gallinules formerly had not been recorded on the nd very often, although the bird nests in Jamaica Bay. ng plovers used to be more plentiful in former years; le sandpipers were late in departing.

ong the perching birds, the red-headed woodpecker is not ften seen on Staten Island these days as it was perhaps nty years ago. It is admittedly a western or southern ies, rather than native to this part of the country.

ong the rarer warblers were the Tennessee, Cape May, kburnian, and certainly the Kentucky. The evening beak which should have headed north before May 17 was ted. This listing is in A.O.U. order:

ed Grebe
le-crested Cormorant
t Blue Heron
n Heron
le Blue Heron
le Egret
on Egret
y Egret
k-crowned Night Heron
ard
k Duck
ail
n-winged Teal
-winged Teal
ter Scaup
lehead
e-winged Scoter
d-winged Hawk
h Hawk
row Hawk
-necked Pheasant
on Gallinule
-palmated Sandpiper
-palmated Plover
ng Plover
deer
k-bellied Plover
y Turnstone

American Woodcock
Spotted Sandpiper
Solitary Sandpiper
Greater Yellowlegs
Lesser Yellowlegs
Knot
Purple Sandpiper
Least Sandpiper
Dunlin
Short-billed Dowticher
Sanderling
Great Black-backed Gull
Herring Gull
Ring-billed Gull
Laughing Gull
Bonaparte's Gull
Common Tern
Least Tern
Mourning Dove
Whip-poor-will
Chuck-will's-widow
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Common Flicker
Red-headed Woodpecker
Hairy Woodpecker
Downy Woodpecker

Eastern Kingbird
Great Crested Flycatcher
Wood Peewee
Horned Lark
Tree Swallow
Bank Swallow
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Fish Crow
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch
House Wren
Carolina Wren
Long-billed Marsh Wren
Mockingbird
Catbird
Brown Thrasher
Robin
Woodthrush
Swainson's Thrush
Veery
Ruby-crowned Kinglet
Starling
White-eyed Vireo
Solitary Vireo
Red-eyed Vireo
Black-and-White Warbler
Tennessee Warbler
Parula Warbler
Yellow Warbler
Magnolia Warbler
Cape May Warbler
Black-throated Blue Warbler
Yellow-rumped Warbler
Black-throated Green Warbl
Blackburnian Warbler
Chestnut-sided Warbler
Bay-breasted Warbler
Blackpoll Warbler
Ovenbird
Northern Waterthrush
Kentucky Warbler
Yellowthroat
Hooded Warbler
Wilson's Warbler
Canada Warbler
American Redstart
House Sparrow
Bobolink
Eastern Meadowlark
Red-winged Blackbird
Baltimore Oriole
Common Grackle
Brown-headed Cowbird
Scarlet Tanager
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Evening Grosbeak
Purple Finch
House Finch
American Goldfinch
Rufous-sided Towhee
Savannah Sparrow
Grasshopper Sparrow
Sharp-tailed Sparrow
Field Sparrow
White-throated Sparrow
Swamp Sparrow
Song Sparrow

The grasshopper sparrow used to nest behind the Tavern-on-the-Green, but this year was found behind the South Be Psychiatric Center. Another rarity is the sharp-tailed sparrow which prefers the short spartina grass in the sal marsh to any other habitat.

The observers were Mr. and Mrs. William Siebenheller, Chairpersons; Stanley Caufield, Gloria Deppe, Henry Flamm

eth Lewis, Lucy James, Vincent Cardinale, Thomas
rfis, Elaine Kantor, Mathilde Weingartner, and Richard
-Eldeen.

me of the more common species were conspicuous by their
nces: pie-billed grebe, any geese, wood duck, barn owl,
ech owl, both cuckoos, cedar waxwing, yellow-breasted
, seaside sparrow, chipping sparrow.

Natural History Records of Staten Island
from the Records of the Section of Natural History

January 1, 1970 to December 31, 1974

r, green, F.T. 3/73
tus, F.T. 5/74
Mountain, European F.T.
73

h, Copper, Benjaminson
74
derwort, F.T. 8/74
bird, Siebenheller 4/74;
egler S.G.M. 3/74;
aub S.G.M. 10/74
link, F.T. 5/74
ing, Snow, Cleaves 1/74
erflies, Shapiro 9/71;
G.M. 1/72
pates, James 10/74

asback, F.T. 3/73
opia, Deppe 8/74
, Yellow-breasted, Davis
72; Siebenheller 11/73
kadee, Boreal, S.G.M.
lomany 11/71
munk, Cleaves 7/73
k-will's-widow, Cleaves
74; 8/74
moss, Foxtail, F.T. 10/73
t, Bennett's, Braun 3/70

Comet, Kohoutek, Weingartner 10/73
Crabapple, Flowering, Von Bevern 1/72
Crane, Crowned, Weingartner 10/73
Crossbill, Red, Fischer 3/70 4/70; J. Stonick S.G.M. 2/74
Crossbill, White-winged, A. Meyer 1/74
Cypress, Bald, F.T. 6/73

DDT, A.Meyer S.G.M. 4/71
Dovekie, Fischer 11/70
Duck, Black, Albine, Von Bevern 1/74
Duck, Eider, A.Meyer 2/74
Duck, Pintail, James 10/74
Duck, Shoveler 10/74

Eagle, Bald, Fischer 2/70; Cleaves S.G.M. 11/71
Earth Star, Benjaminson 4/70
Eclipse, Buegler S.G.M. 1/70 Nelson S.G.M. 10/72

ENVIRONMENTAL ISSUES ON STATEN ISLAND

by Dr. Richard H. Schwartz
Staten Island Community College

Recent rapid growth on Staten Island has resulted in many environmental problems. In order to create an awareness to explore and discuss these problems, and to consider methods of preserving and enhancing the borough's ecological features, I introduced a new course, "Environmental Issues on Staten Island," at Staten Island Community College. I taught this three-credit course in the summer and-fall semesters of 1973 and the spring-and-fall terms 1974.

Films, field trips, guest speakers, student reports, ar class discussions were used to explore various Staten Isl issues. One of the strongest features of the course has been the ability, knowledge, and enthusiasm of the studen Almost all are residents of Staten Island who were able t contribute information about communities where they live work. The students included several teachers and policen a naturalist, an ornithologist who has taken pictures of birds in many parts of the world, a former candidate for New York State Assembly, a member of a community planning board, and some who work or had worked in jobs related to the local environment: Fresh Kills Landfill, High Rock Davis Wildlife Refuge, and Richmondtown.

Unanimously the students shared my concern and distress the many environmental problems caused primarily by the rapid development with inadequate planning that has occur recently on Staten Island.

The following is a summary of the issues that were considered in the course, how we studied them (through fi guest speakers, and field trips) and student reaction. T represents a composite of what was done in the four terms (not all of these things were done every semester).

Solid Waste Disposal

Since the world's largest garbage dump is here at Fresh Kills on Staten Island, this was a big issue each term of the course. Several students were sanitation workers and they added much to class discussions, presented slide sho and helped bring down a guest speaker. We saw the film, To Our Necks: The Garbage Problem," which focused on New York City's solid waste problems and discussed the

ificance of Fresh Kills landfill. We visited Fresh s landfill twice, once under the guidance of a student works there. Two guest speakers, Stanley Halle, who was lved in planning for future waste disposal methods, and ard Napoli, director of public information for the tation Department added much to our knowledge of the lem. Most students were totally unaware of the nature his problem before taking the course. They were very essed with its importance. The fact that the average on throws away daily over five pounds of garbage and this figure (which was 2.75 pounds in 1920) is expected each eight pounds in less than 10 years, took on tional meaning from our trips to the landfill. Here are ents from two students after our visits:

visit to the Fresh Kills Landfill makes one feel over-elmed by the reality of so much debris in one area. w many of us have ever given any thought to what we a wasteful, self-indulgent society throw away? Here is difficult to avoid the truth: we have all ntributed to the stench of fermenting and decomposing terial."

ay after day, barge load after barge load, it comes, e by-products of a society of automation. People are cked into a fixed pattern of buy-use-dispose, buy-use-spose. Paper products, plastics in endless numbers, at's all there seems to be. All put here by a society ippled by conveniences, and ironically, crippled thout them."

class members were unaware that of the 30,000 pounds of age a day produced in New York City, about 13,000 pounds barged to Staten Island. Since Fresh Kills is supposed each its final capacity by 1985, the class was rested in learning from our guest speakers about some of methods under study of handling garbage, such as high-erature incineration, remote disposal, burning of the age as a fuel, and the possible construction of an hore island made out of garbage.

s and Natural Areas

id some exploring of parks and natural areas each term. iked through the Greenbelt, once under the direction of

Cynthia Jacobson of High Rock, once with the Sierra Club, and once with groups dedicated to preventing the Richmond Parkway from being built through the Greenbelt. We visit High Rock Park Conservation Center several times, explore the Arden Woods under the guidance of Professor Irving Robbins of the college's Physics Department, who has been striving to preserve these woods as a natural area, and visited the Davis Wildlife Refuge with a student who was a former tour guide as our leader. Richard Buegler, a memb of the Staten Island Sierra Club, and an active participa in trying to preserve Staten Island's natural areas, show an excellent set of slides of just about every park and natural area on Staten Island. Members of the Beachview Manor Civic Association showed slides of the "Last Chance Pond," a natural area that they are trying to preserve. Bruce Weber, a naturalist from Gateway (Staten Island Division) showed slides and discussed plans for future development of Gateway on Staten Island.

The class was very impressed with the beauties of the natural areas on the island. Many expressed surprise that such areas existed, and were unanimous in feeling that there should be strong efforts to preserve such places. They generally felt that no road should be built through the Greenbelt. They were equally impressed with the efforts of the Federal Government at Gateway and optimisti regarding the future prospects.

Here are the representative comments of two students after hiking the Greenbelt:

> *"If the highway is built as originally proposed, an interesting and important woodland would be gone. Very few people in one of the most populated areas in the world know of this wonderful little wilderness a few miles from their homes. This area provides a totally different world from the rush, rush, rush, pop-a-pill, dog-eat-dog world of the city. Here one can walk for hours without having to confront the 'progress' of the modern world. It is another world: streams running into ponds, chipmunks, squirrels, rabbits, pheasants, muskrats, wild flowers, mushrooms, beautiful trees bending with the wind. This should be a place for people to relax their eyes, ears, and hearts. We really don't have to travel to the Grand Canyon or Yellow-*

stone Park to see and feel nature's mystique; just walk up the Olmsted Trail to a well trodden knoll called 'The Cathedral' and look at the tall, sturdy trees around you and the hillside sloping downward around you. Take a deep breath and let it out. 'This is good.'"

'As a rule, we are a people of luxury. We ride instead of walk and we seek ways to save time; so that we can do more things. We rush here and there, we're always on the move through our concrete jungles. It is not surprising then to find that the incidents of nervous breakdowns are increasing. Contrary to popular belief we do need places of quiet, places to escape to, to preserve our sanity, if nothing else. The Greenbelt, the Olmsted Trail in particular, illustrates most beautifully the need for such places of escape. Here, as one walks down the trail, nature unveils itself as what it really is, an incomparable master of design and creation. The wide variety of trees and plants seems almost alien to the New York we envision: a cold, callous place, void of all greenery and covered with concrete. However, here in abundant splendor are majestic trees, bushes with edible berries, lakes teeming with life, and colorful song-birds. It is wilderness as it should be, pure and unspoiled. The Olmsted Trail presents an atmosphere that everyone should experience, for each experience is unique to each person. I found conversation at a minimum, for everyone was lost in his own world, nature's world. The Olmsted Trail is truly the ultimate experience of sight and mind."

e is a typical student comment on the Gateway (most nts felt similarly about all the natural areas we ed):

I believe these areas should be set aside for the needs of the City people and at the same time for the birds and wildlife who also need an escape from the overcrowding and overdeveloping in the city area. As a national park the Gateway areas should be spared from private devastation. They

would be places where people could relax, have fun, and learn about environment. Maybe from a project like this, an awareness of man's dependence on his surroundings and his need for a clean environment would grow in urban dwellers that rarely seen anything but paved highways and buildings."

Housing

We visited a variety of housing developments:

1) Village Greens, the largest planned unit developmen (PUD) in New York City, where the houses are clustered together, but common open areas and recreation facilities are provided. Students generally had negative attitudes before our visit. Some had these attitudes reinforced du to the closeness of the homes and the crowdedness of the streets with automobiles. But many were impressed with t interior design of some of the houses and the convenience of having nearby recreational facilities.

2) A new housing development in the New Springville ar Most students were very unhappy with this kind of housing which provides little planning for recreation and communi feelings. Here is a student's reaction, which sums up th feelings of many:

"The homes in the New Springville area are like so many other housing developments that have sprung up on Staten Island within the last decade. There are row on row of similar looking, box-type, one-and two-family homes. The outlining streets are clogged with row on row of cars. Each family has its own 40' x 100' lot. The only common area is the street, which is in the grid pattern. Because of the lack of planning in developments such as these, there are few schools, parks, or recreational facilities in the vicinity."

"This development stands in the midst of a woodland and seems to be cutting its way deeper into that woodland. There are no large, long-standing trees in the development, which shows that the area was leveled in order to be developed, with no consideration given to the existing state of the land. As one observer has said, it looks like 'an arid desert of houses--no greenery--no touch of nature--just

houses.' Hopefully residents will plant trees and shrubs and bring a little nature back."

Greenbrook, a planned group of one-family, detached and -detached homes. Here, there were efforts to build eational facilities into the development, but students tioned whether they would be adequate. Contrary to nbrook's advertising, we found that the area was not of "trees, singing birds, and running brooks." Many ents were impressed with the exterior and interior gn of the homes.

nold Kotlin, of the Staten Island Planning Office, ussed the advantages of Planned Unit Development with He outlined the design features of two new develop- s: Elmwood Park and Rossville PUD.

seph Margolis, deputy director of the Office of Staten nd Development, spoke to us several times about "Housing Conservation." His theme was that we can have housing ne island without destroying the environment. He ented a wide ranging discussion of all types of housing taten Island. He pointed out that, due to the economic ation, there will be very little new detached one-or family housing on the island in the future.

e term, Joseph Sherry, an architect with the Development ce spoke to us. He presented much useful information a wide variety of housing issues.

er all, students felt that there should be a halt to anned developments and that there should be greater rts to preserve trees and natural features when ding.

h Richmond Development

s was an issue each semester the course was given. At , the controversy was over State Senator Marchi's lation. After that failed to pass in Albany, the ssion centered on the land-use plan of the South ond task force.

ert Dormer of the Rouse Company spoke about his group's t on the advantages of building a new city in South ond that would incorporate the best planning and opment. Joe Margolis spoke favorably on the Marchi and stressed that Staten Island could turn into another s if the Marchi legislation did not pass. Mr. Peters why his group, the Waterfront Watch, opposed Senator i's South Richmond legislation. While they favored

planning for the area, they feared the ecological consequences of the proposed landfill and also wanted to make sure that Great Kills Park would be preserved.

Class members unanimously favored planned development f the area, but many had reservations about the Marchi bill There was general agreement with the proposals of the Sou Richmond task force committee, especially with regard to preservation of natural areas and the pre-planning of facilities such as schools, recreation, and sewers.

Distrigas LNG Tanks

We tried to obtain both sides of the controversial issu of the possible storage of LNG (liquid natural gas) on Staten Island.

Eugene Cosgriff, president of BLAST (Bring Legal Action Stop the Tanks) told the class why he thought LNG should be stored in a populated area such as Staten Island. The many hours that Mr. Cosgriff has devoted to his cause wer very evident. He stated that there is really no shortage natural gas and described many of the dangers associated with shipping and storing LNG. He reviewed the history o LNG-related mishaps including the disasters in Cleveland 1944 and Bloomfield, Staten Island, in 1973. The student were very impressed by his arguments. John Quinn, a memb of BLAST who lives just outside the site of the tanks, al spoke to us about his fears of a disaster at the tanks.

Representatives of Distrigas, the company that is build the tanks also spoke to us. Robert Norton, their vice-president in charge of engineering, catalogued the many engineering safety factors built into the tanks and their surroundings. William Browning, their environmental expe showed slides which described the need for the gas, its advantages as a fuel, and the precautions taken to avoid possible mishap. Both these men, on separate occasions, along with other Distrigas representatives guided us arou the tank site. The class was made aware of the many effo that were expended to build safety into the structures. Nevertheless, many still felt that some disaster could oc and would be happier if the tanks were built elsewhere. is hoped that the class will explore this issue in great detail in the future.

Sewers and Water Pollution Control

Difficulties related to poor drainage and flooding see to be a prevalent problem for many of the students in th

ss. Thus, they were very interested in finding out what being done to alleviate matters. Hugo Vervuurt, senior ff engineer for the Office of Staten Island Development, ke to us several times about sewers and water pollution trol. As he has been involved with these issues on an ost day-to-day basis for several years, he was able to vide much valuable information. The class was interested learn about the present upgrading and expansion of the t Richmond and Oakwood sewage treatment plants as well as interceptor sewer system that is being constructed und the perimeter of the island.

e visited the Oakwood Sewage Treatment Plant, where the nt engineer, Mr. Goldstein, explained the complete sewage atment process. Students commented favorably on how the nt was run and how clean and relatively free of odors it .

ome other guest speakers that helped us develop insight 1 regard to Staten Island issues were:

liam Huus, Reporter, Staten Island Advance, "Problems of rowth"

d Smith, Director, Staten Island Urban League, nvironmental Problems on the North Shore"

i Kirsch, Ecology Teacher, Susan Wagner High School, nvironmental Education at Susan Wagner High School"

Braniff, Advisor to Staten Island Borough President garding Community Planning Boards, "The Role of mmunity Planning Boards"

ch student was required to report to the class on some e related to the Staten Island environment. Due to the cation of most students and their knowledge of and lvement in specific problems locally, these reports ributed much to the learning experience of the entire s. Through these reports the students were able to e deeper into issues that the class has considered such ousing developments, South Richmond, Richmond Parkway, Fresh Kills Landfill, or to explore issues that weren't rwise covered in detail due to lack of time, such as pollution, planning for the St. George area, noise ution, and possible re-development of Jersey Street. students showed films or slides that they had taken of ous areas or issues on Staten Island.

e class tried to involve many Staten Islanders in ing out about and improving the Staten Island environ-

ment. Toward this aim, in addition to events mentioned previously, the class:

-- published a 26-page booklet discussing the activitie of the class and listing suggestions for environment improvement. This has been widely distributed on St Island.
-- painted a mural of scenes depicting Staten Island environmental problems at the Staten Island Mall.
-- conducted a four-hour bus tour of Staten Island environmental sites, in conjunction with the Jewish Community Center.
-- sponsored a forum at the Jewish Community Center on "Environmental Issues on Staten Island."

Many groups have been most helpful in providing inform tion, advice, and assistance to myself and the class. These include High Rock Park Conservation Center, the St Island Institute of Arts and Sciences, the Office of Sta Island Development, the Staten Island Office of City Planning, the *Staten Island Advance*, and the *Staten Isla Register*. In addition to the guest speakers, many individuals, too numerous to mention, provided very valuable assistance.

The course has been successful in informing students a the Staten Island environment and ways to improve it. M students reported a change in their attitudes and habits they tend to be more careful about not wasting things, t are more aware of issues and read articles in the local papers that they formerly might have passed over, they encourage others to be more concerned about the environm and they explore natural areas on Staten Island on their own or with friends.

It is hoped that many more schools--elementary, inter-mediate, and high schools, as well as colleges--will develop and adopt courses such as the one outlined in th article. When many students get involved in improving t own areas, this can help insure the best possible environment for the future. If you would like more information, or have comments or suggestions, please wri to Professor Richard Schwartz, Staten Island Community College, 715 Ocean Terrace, Room B139, Staten Island, Ne York 10301.

ctors' *Encyclopedia of Shells*. Edited by S. Peter ce. Publisher: McGraw Hill. 1974. $19.95

beautiful book fulfills the dreams of many a collector ells. World-wide in scope, if the user supplements it a good book on local marine fauna, it should prove very ble. The illustrations deal with lovely and exotic es more than they do with less spectacular shells. North Atlantic species are not illustrated.

Cameron's clear and colorful photographs are fine for fication, and the arrangement of photos adjacent to escriptive text is very useful.

uniformity of the text appeals to me, and the rial key at the beginning of the book should be a great for the collector. The author uses the current clature. -- MPW

an Sea Shells. (Second edition.) R. Tucker Abbott isher: Van Nostrand-Reinhold. 1974. 663 pages, ill., 24 col.plates., extensive index. $49.50

'54 edition of *American Sea Shells* by Dr. Abbott was the outstanding books in the fields of malacology and logy. This new and expanded edition has the same and is probably the most important work in this No other work covers all classes of mollusks found rica's coastal waters. For years, it will be THE nce book on this subject.

thousand-five-hundred species are listed with 3,000 of ully described and most of these illustrated. For the list as well as the collector, there is a complete g of all classes, families, genera, and wherever ary, a description of the type species.

e have been a number of name changes, some of which one with considerable regret. Many of these changes ed as a result of intensive research by specialists ir respective fields, although some were initiated by bott who, in these cases, explains his reasoning. ollectors, however, may not be happy with the changes. eat advantage in this new edition arises from the ement of illustrations near the descriptive text in ases. Some popular names of species have also been ed with the description so that amateurs will not be me by scientific identification.

is an indispensable book for any serious collector.

The Dictionary of Butterflies and Moths in Color. Allan Watson, Paul E. S. Whalley; Introduction by W. Donald Duckworth. Publisher: McGraw Hill. 1975. $29.95 until May 31, 1976; thereafter $39.95.

A profusely illustrated publication of 296 pages with 405 numbered reproductions of color photographs of butterflies and moths. It is worldwide in scope and, it is stated, 1,000 species are shown. It offers a combination of photo graphs from nature which are brilliantly reproduced, plus photographs from stretched specimens in the collections of the British Museum (Natural History). As museum specimens gradually lose some of their brilliance of color, the reproduction of these is somewhat more subdued though stil very satisfactory. The photographs from nature usually ar of combinations up to a dozen or more. This has prevented a systematic arrangement of the figures. The text that follows after the illustrations is alphabetically arranged by genera and also by species within each genus. At the end of each specific description is a reference to the numbered photograph if the species is one that has been illustrated.

B

PROCEEDINGS

Staten Island Institute of Arts and Sciences

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FISHES OF THE ARTHUR KILL

—Robert G. Howells and
Harold M. Brundage III

The Arthur Kill is a tidal strait which connects Raritan and Newark bays and separates Staten Island from New Jersey. It is a major entrance channel into New York Harbor and serves one of the largest petroleum refining and storage areas on the eastern seaboard. The Arthur Kill receives large quantities of municipal and industrial effluents which result in extremely poor water quality. In addition, extensive dredging, bulkheading, and landfill operations have severely reduced suitable adjacent littoral and wetland habitats.

Ichthyological Associates, Inc. conducted ecological investigations in the Arthur Kill from January 1972 to December 1973 and from February 1975 to May 1976. Studies to determine the species composition and relative abundance of fishes in the Arthur Kill are presented herein.

During 1972 and 1973, fish were collected in the vicinity of Linden and Sewaren, New Jersey. In 1975 and 1976, fish were again collected in the Linden area (Fig. 1). Collections were made with a trapnet, a 16-ft semiballoon trawl, a 10-ft common seine and a 25-ft bag seine. Fish impinged on industrial cooling water intake screens were also collected. Planktonic fish eggs and larvae were sampled with a 0.5-m plankton net. Fishes were identified with the aid of Bigelow and Schroeder (1953) and Hildebrand and Schroeder (1927). The nomenclature followed that of Bailey et al. (1970).

Sixty-three species of fish representing 33 families were taken in the Arthur Kill (Table 1). For the purpose of this paper their occurrence was noted as abundant, common, occasional, and rare. Rare species were classified as those for which five or less specimens were taken during a year of collecting and occasional species as those with 20 or less specimens collected. The actual numbers of specimens taken for each species has been omitted due to different collection methods and varying degrees of fishing intensity between localities. The above categories considered seasonally abundant species. For example, the winter flounder was regarded as common even though it was only taken from late fall through early spring.

The mummichog was the only abundant species. Occasionally, more than 1,000 were taken in two hauls of a 25-ft bag seine. During colder months, the mummichog retired to channels of tributary creeks and were less susceptible to most collection methods. Fritz et al (1975) observed that mummichogs moved up creeks with the advance of winter.

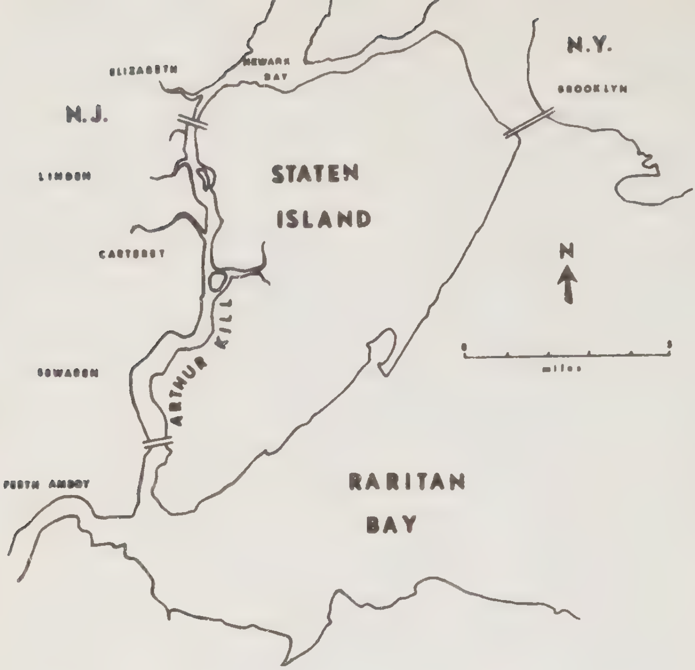

Figure 1. Location of Arthur Kill in relation to Staten Island and New Jersey.

Blueback herring, alewife, bay anchovy and sand lance were common at all localities. Juvenile and adult American eel, American shad, silver hake, Atlantic and tidewater silverside, and striped bass were also taken in substantial numbers but were less common than the above species. Generally, only young striped bass and American shad were collected. The sunfish, carp, golden shiner, silvery minnow, and banded killifish were occasionally collected. They were most frequently taken after periods of heavy freshwater runoff and originated from freshwater streams and impoundments in the area.

The Arthur Kill has in the past been considered nearly abiotic (Federal Water Pollution Control Administration, 1967). It is apparent from the present studies that in spite of severe environmental degradation the Arthur Kill is still utilized by a number of species of fish.

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Table 1. Fishes taken in the Arthur Kill in the vicinity of Linden and Sewaren, New Jersey. Abundance of each species is indicated as abundant (A), common (C), occasional (O), and rare (R).

Species	Linden 1975-76	Linden 1972-73	Sewaren 1972-73
Sturgeons-Acipenseridae			
Atlantic sturgeon-*Acipenser oxyrhynchus*	-	-	R
Freshwater eels-Anguillidae			
American eel-*Anguilla rostrata*	C	O	O
Conger eels-Congridae			
Conger eel-*Conger oceanicus*	R	-	-
Herrings-Clupeidae			
Blueback herring-*Alosa aestivalis*	C	C	C
Alewife-*Alosa pseudoharengus*	C	C	C
American shad-*Alosa sapidissima*	C	O	C
Atlantic menhaden-*Brevoortia tyrannus*	O	O	O
Atlantic herring-*Clupea harengus*	-	R	O
Gizzard shad-*Dorosoma cepedianum*	R	-	-
Anchovies-Engraulidae			
Striped anchovy-*Anchoa hepsetus*	R	-	-
Bay anchovy-*Anchoa mitchilli*	C	C	C
Smelts-Osmeridae			
Rainbow smelt-*Osmerus mordax*	O	O	O
Minnows and carps-Cyprinidae			
Goldfish-*Carassius auratus*	R	R	-
Carp-*Cyprinus carpio*	R	-	-
Silvery minnow-*Hybognathus nuchalis*	R	-	-
Golden shiner-*Notemigonus crysoleucas*	R	-	-
Codfishes-Gadidae			
Fourbeard rockling-*Enchelyopus cimbrius*	R	-	-
Silver hake-*Merluccius bilinearis*	C	-	C
Atlantic tomcod-*Microgadus tomcod*	C	R	C
Red hake-*Urophycis chuss*	C	R	O
Spotted hake-*Urophycis regius*	O	-	-
White hake-*Urophycis tenuis*	R	-	-
Cusk eels and brotulas-Ophidiidae			
Striped cusk eel-*Rissola marginata*	R	-	-
Needlefish-Belonidae			
Atlantic needlefish-*Strongylura marina*	R	-	R
Killifishes-Cyprinodontidae			
Banded killifish-*Fundulus diaphanus*	O	-	-
Mummichog-*Fundulus heteroclitus*	A	A	A
Silversides-Atherinidae			
Tidewater silverside-*Menidia beryllina*	C	R	O
Atlantic silverside-*Menidia menidia*	C	O	O
Sticklebacks-Gasterosteidae			
Fourspine stickleback-*Apeltes quadracus*	R	-	-
Threespine stickleback-*Gasterosteus aculeatus*	C	O	O
Pipefishes and seahorses-Cyngnathidae			
Lined seahorse-*Hippocampus erectus*	C	O	C
Northern pipefish-*Syngnathus fuscus*	C	O	C

Species	Linden 1975-76	Linden 1972-73	Sewaren 1972-73
Temperate Basses-Percichthyidae			
White perch-*Morone americana*	C	O	O
Striped bass-*Morone saxatilis*	C	C	O
Sea Basses-Serranidae			
Black sea bass-*Centropristis striata*	R	-	R
Sunfishes-Centrarchidae			
Pumpkinseed-*Lepomis gibbosus*	O	R	R
Bluegill-*Lepomis macrochirus*	O	O	R
Black crappie-*Pomoxis nigromaculatus*	R	R	-
Bluefishes-Pomatomidae			
Bluefish-*Pomatomus saltatrix*	C	R	O
Jacks and pompanos-Carangidae			
Jack crevalle-*Caranx hippos*	-	R	O
Lookdown-*Selene vomer*	C	-	O
Moonfish-*Vomer septapinnis*	-	-	R
Porgies-Sparidae			
Scup-*Stemotomus chrysops*	O	-	-
Drums-Sciaenidae			
Silver perch-*Bairdiella chrysura*	O	R	-
Weakfish-*Cynoscion regalis*	C	R	O
Spot-*Leiostomus xanthurus*	R	R	C
Atlantic croaker-*Micropogon undulatus*	R	-	-
Wrasses-Labridae			
Tautog-*Tautoga onitis*	R	R	R
Cunner-*Tautogolabrus adspersus*	R	R	-
Gunnels-Pholidae			
Rock gunnel-*Pholis gunnellus*	R	-	-
Sand lances-Ammodytidae			
Sand lance-*Ammodytes sp.*	C	C	C
Gobies-Gobiidae			
Naked gogy-*Gobiosoma bosci*	O	O	O
Butterfishes-Stromateidae			
Butterfish-*Peprilus triacanthus*	O	R	R
Searobins-Triglidae			
Northern searobin-*Prionotus carolinus*	O	R	O
Striped searobin-*Prionotus evolans*	O	-	R
Sculpins-Cottidae			
Grubby-*Myoxocephalus aenaeus*	C	O	-
Lefteye flounders-Bothidae			
Smallmouth flounder-*Etropus microstomus*	C	-	R
Summer flounder-*Paralichtys dentatus*	-	-	O
Windowpane-*Scophthalmus aquosus*	R	-	O
Righteye flounders-Pleuronectidae			
Winter flounder-*Pseudopleuronectes americanus*	C	O	R
Soles-Soleidae			
Hogchoker-*Trinectes maculatus*	O	-	-
Triggerfishes and filefishes-Balistidae			
Orange filefish-*Aluterus schoepfi*	-	-	R
Puffers-Tetradonidae			
Northern puffer-*Sphoeroides maculatus*	R	-	-

AULACODISCUS SPECIES OF KAMISCHEV FLORA

—Joseph F. Burke and Warren E. Flint

The location of the fossil marine deposit of Kamischev has eluded diatomists. In 1934 Cheneviere, in the *Bull. Soc. Fran. Micr.*, 3:103-107, pl. 5-8, stated his sample of diatomaceous earth was from Kamischev, in Central Russia, a rather vague description. In *The Handy Reference Atlas of the World*, 10th Edition, edited by John Bartholomew, published by Charles E. Lauriat Co., Boston, a map on pp. 100-101 is designated Central Russia, at roughly 52° to 60° North latitude and 30° to 50° East longitude.

R. Ross, in *Trans. Bot. Soc. Edinb.* 41:323-342, 1972, discussed various possibilities in some detail but without a clearcut solution.

In *The International Atlas*, published by Rand McNally & Company, copyright 1969, there are shown, on map 70/71, two settlements, possibly 15 to 20 miles apart, with the name Kamyšev, but there is no assurance one of these might have been the source of Cheneviere's sample. It is unfortunate he did not have a more precise geographical location, for the sample is an important one from the standpoint of its flora.

The presentation of species in the deposit, by Cheneviere, is confusing and would seem to indicate contamination of his material had occurred at some point in its preparation. This is particularly evident on his pl. 7.

In this study of the species of Aulacodiscus occurring in the Kamischev deposit, use has been made of a long series of strewn slides mounted in 1963 by R.F. Lawrence, New York, from a sample he had received from A. Elger, Eutin, Holstein. As a control, selected mounts by Dr. A. L. Brigger, California, from a different sample, were examined.

The following species were described originally from the locality of Kamischev:

A. allorgei Cheneviere	*A. hirtus* Barker & Meakin
A. anastomosans Wise	*A. insignis* Hustedt
A. conspectus Wise	*A. lemardeleyi* Cheneviere
A. gemmatus Barker & Meakin	*A. subexcavatus* Hustedt

Of the above species, *A. anastomosans* was recorded by Wise also from Carlovo, and *A. gemmatus* by Barker & Meakin also from Carlovo. In both instances this would seem to be in error, possibly due to a Carlovo sample having been contaminated with Kamischev material.

An additional species, named originally from Mors, Jutland, is to be added to the above list of species:

A. suspectus Schmidt

While Cheneviere did not list *A. suspectus* from Kamischev, he did consider the Kamischev diatomaceous earth to be related to the Jutland deposits, by the flora. Hustedt included Mors as a locality for his *A. subexcavatus.*

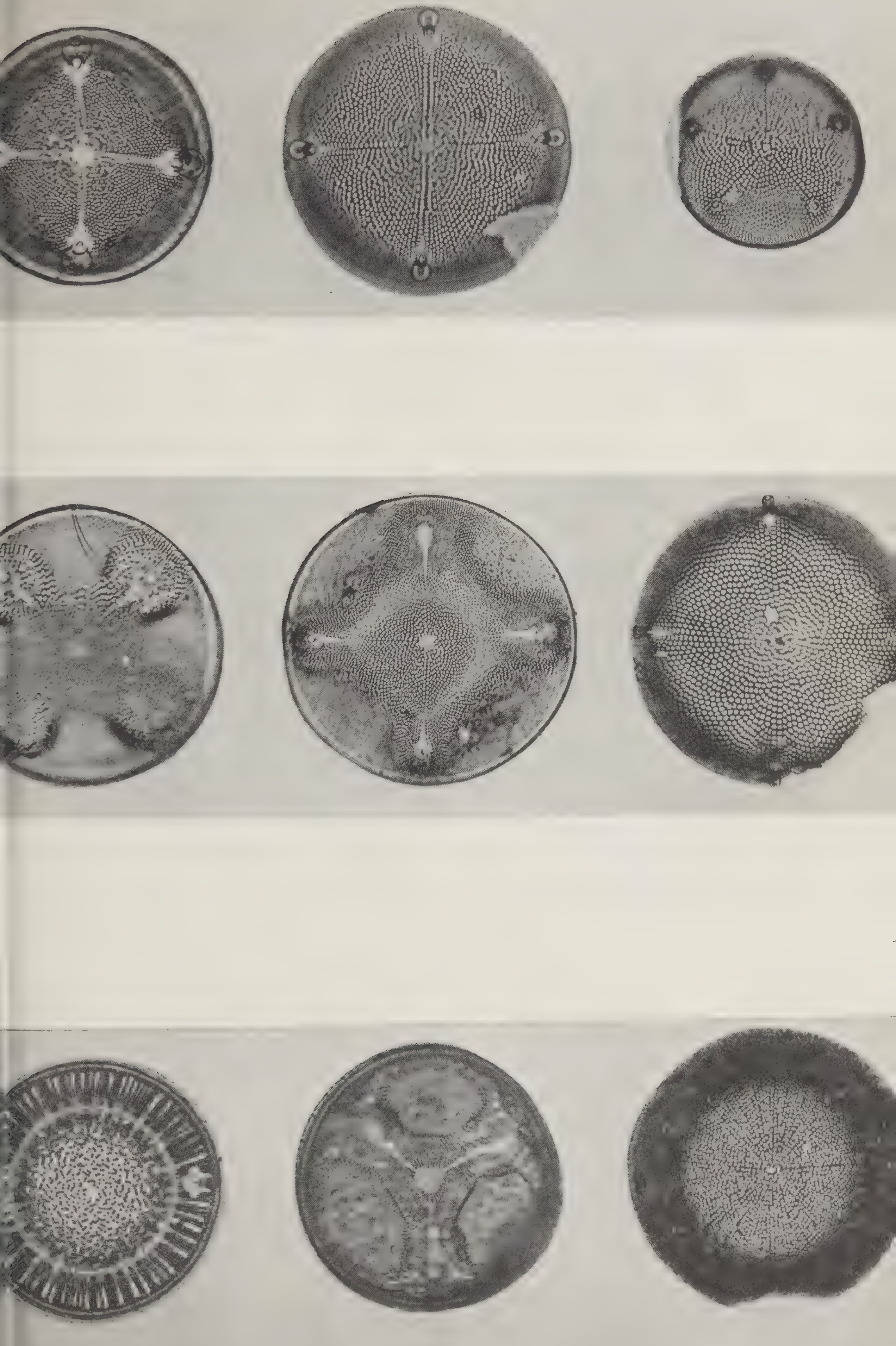
Tentative listings:

Though it is not being listed with the above species in the Kamischev flora, an interesting form has been found in Kamischev samples. Of it, Dr. A. L. Brigger has mounted a number of specimens. One specimen has been found on a Lawrence strewn slide from the Elger sample. E. C. P. Bone, Sussex, England, has found a specimen in his Kamischev material. He was unable to compare it at the British Museum (Natural History) as no specimen of the species was available there. Its name is *Aulacodiscus peragalloi* Pantocsek and the type locality of the species is Kusnetzk. The deposits of Kamischev and Kusnetzk do not seem to be related so the identification, though seemingly plausible, is tentative.

Another species that possibly can be attributed to Kamischev is *Aulacodiscus erinaceus* Barker & Meakin. The type locality given by the authors was Carlovo. This might have been due to the contamination suggested above. At the time of publication, February 27, 1948, the slide containing the specimen illustrated by Barker & Meakin apparently was already in the John B. Woodward collection. In a telephone conversation on January 21, 1963, Woodward indicated to Burke that he believed his specimen was that illustrated by Barker & Meakin. The specimen is on a slide with a selected group of other Aulacodiscus species, labelled merely "Aulacodiscus from Russia" and dated Oct. 1946.

An earlier dated Meakin slide, Jan. '46, is in the collection of the British Museum (Natural History). It contains a specimen that possibly is *A. erinaceus*. On a visit to the museum on October 30, 1974, E.C.P. Bone viewed this slide, Wise Collection 4772, B.M. No. 76918. It contained five specimens, four of which *A. hirtus, A.*

Aulacodiscus allorgei Cheneviere	.110 mm.
Aulacodiscus anastomosans Wise	.125 mm.
Aulacodiscus conspectus Wise	.85 mm.
Aulacodiscus gemmatus Barker & Meakin	.120 mm.
Aulacodiscus hirtus Barker & Meakin	.192 mm.
Aulacodiscus insignis Hustedt	.190 mm.
Aulacodiscus lemardeleyi Cheneviere	.110 mm.
Aulacodiscus subexcavatus Hustedt	.115 mm.
Aulacodiscus suspectus Schmidt	.130 mm.



allorgei, *A. anastomosans* (paratype), and *A. insignis* are species of the Kamischev flora. On publication, Wise linked the paratype of *A anastomosans* to Carlovo. A fifth specimen, not identified on the slide, appeared to Bone to be *A. erinaceus* and he felt further study would confirm it. He compared the specimen with a photographic print by Warren E. Flint of the specimen in the Woodward collection. According to Bone the identifications on B.M. No. 76918 were in the hand of Wise, not Meakin, with no indication of Wise's possibly having recognized the unidentified specimen as *A. erinaceus*.

On November 6, 1952, F.C. Wise, Sussex, England, wrote to John B. Woodward, inquiring if he had the holotype and if so could he furnish a description of the processes. A specimen from Kamischev was engaging his attention. It had been referred to Meakin, who lacking the holotype, replied that relying on memory it could be *A. erinaceus*.

Another Jutland species, *Aulacodiscus jutlandicus* Kitton, may be added to the Kamischev flora, though this will have to be based upon a single specimen. The latter has been compared with two specimens from Mors. Correspondence with the latter is close, with the Kamischev specimen being somewhat darker and with slightly longer processes. Occurrences at both localities would seem very scarce so it would be comforting if additional examples could be examined.

Aulacodiscus excavatus Schmidt. a species of the Simbirsk flora, was illustrated by Hustedt in Atlas der Diatomaceenkunde, pl. 459, figs. 1 and 2, June 1944, from Kamischev. Specimens attributed to Kamischev are scarce. Those available show variation in form, from close to the usual Simbirsk form to variations that take on some of the characters of A. subexcavatus.

Aulacodiscus archangelskianus Witt is represented by sporadic examples. This also is a Simbirsk species and its occurrence in Kamischev samples needs to be explored further.

ANNUAL CHRISTMAS BIRD COUNT 1975

A very successful bird count was taken on December 21, 1975: there was a high count in 16 species of which five were unusually high—653 mallards (previous high count, 368), 36 ruddy ducks (p.h.c., 5), 259 chickadees (p.h.c., 121), 439 cowbirds (p.h.c., 310), 449 juncos (p.h.c., 325). The total number of species seen was 94 and the total of individuals, 94,876.

Mr. and Mrs. John James recorded an all-time first record for the Staten Island Christmas count: a great, or common, egret in a salt creek near Travis. This bird is not usually seen this far north when the ponds are frozen.

The unusually mild weather during the fall undoubtedly had something to do with this record count. On the day of the census, however, a cold raw wind was blowing from the north, making the observers' eyes water and their faces, blue; air temperature was between 22° F and 25° F., and the ponds were freshly frozen. The promised snow did not arrive until the end of the day.

In their travels, the observers visited most parks, beaches, shore fronts, woodlands, fields, marshes, and the Fresh Kills Landfill. They turned in a fire alarm for a brushfire, chased three bow-and-arrow hunters out of Allison Park, answered many questions from curious passers-by, and became reacquainted with many bird-conscious friends who had stocked their birdfeeders. At the end of the day, the nine parties enthusiastically turned in their exciting finds: mute swans, Canada geese, snow geese, pintail, shoveler, canvasback, three kinds of mergansers, one dunlin, laughing gulls, kingfisher, red-bellied woodpecker, winter wren, pine siskin, towhee, and fox sparrow. All of these are quite rare on Staten Island at this time of the year.

Both the rare yellow-bellied sapsucker and the hermit thrush appeared in the same tree or bush as in previous years which is an unusual coincidence. Missing on the count were the normally common double-crested cormorant and the white-winged scoter.

The observers were Timothy Abraham, Doris Barlow, Mary Benjaminson, Philip Benjaminson, Richard Buegler, Robert Clermont, Charles Fallon, Jeffrey Fallon, Howard Fischer, Henry Flamm, William Gibson, Lucy James, Elaine Kantor, Susan Kerber, Kenneth Lewis, Thomas Materfis, Anna Meyer, Charles Pearson, Norma Siebenheller, William Siebenheller, John Stonick, Bruce Weber, Mathilde Weingartner, Richard Zain-Eldeen.

Red-throated loon, 1
Horned grebe, 102
Pied-billed grebe, 2
Great blue heron, 6
Common egret, 1
Black-crowned night heron, 19
Mute swan, 4
Canada goose, 65
Brant, 43
Snow goose, 16
Mallard, 653
Black duck, 1,000
Gadwall, 1
Pintail, 4
Green-winged teal, 78
Shoveler, 20
Redhead duck, 8
Canvasback, 72
Greater scaup, 3,417
Common goldeneye, 217
Bufflehead, 578
Oldsquaw, 115
Surf scoter, 5
Ruddy duck, 36
Hooded merganser, 5
Common merganser, 2
Red-breasted merganser, 13
Red-tailed hawk, 9
Rough-legged hawk, 17
Marsh hawk, 4
Kestrel, 19
Ring-necked pheasant, 47
American coot, 11
Killdeer, 58
Black-bellied plover, 2
Ruddy turnstone, 26
Common snipe, 35
Greater yellowlegs, 8
Purple sandpiper, 78
Dunlin, 31
Sanderling, 35
Glaucous gull, 2
Iceland gull, 1
Great black-backed gull, 15,865
Herring gull, 45,000+
Ring-billed gull, 374
Laughing gull, 2
Bonaparte's gull, 234
Mourning dove, 395
Screech owl, 2
Belted kingfisher, 2
Yellow-shafted flicker, 6
Red-bellied woodpecker, 1
Yellow-bellied sapsucker, 1
Hairy woodpecker, 6
Downy woodpecker, 39
Horned lark, 56
Blue jay, 212
Common crow, 1,342
Black-capped chickadee, 259
Tufted titmouse, 26
White-breasted nuthatch, 48
Red-breasted nuthatch, 3
Brown creeper, 2
Winter wren, 1
Mockingbird, 72
Catbird, 2
Robin, 57
Hermit thrush, 6
Cedar waxwing, 11
Starling, 18,111
Yellow-rumped warbler, 13
House sparrow, 554
Eastern meadowlark, 11
Red-winged blackbird, 2,093
Rusty blackbird, 4
Common grackle, 994
Brown-headed cowbird, 439
Cardinal, 130
House finch, 77
Pine siskin, 19
Red crossbill, 7
American goldfinch, 38
Rufous-sided towhee, 1
Savannah sparrow, 3
Slate-colored junco, 449
Tree sparrow, 108
Chipping sparrow, 1
Field sparrow, 1
White-throated sparrow, 625
Fox sparrow, 6
Swamp sparrow, 8
Song sparrow, 294
Snow bunting, 1

Total number of species: 94
Total individuals: 94,876

STATEN ISLAND WATERBIRD COUNT, 1976

January 18, 1976 was an extremely cold day—15° F with the wind at 19 MPH. For that reason, all ponds were completely frozen over except for locations near the inlets into deeper ponds where a small area of water would still be open. There had been a considerable freeze-up for several weeks before this count and the severe weather had driven many of the dabbling ducks out of the ponds and lakes and even had propelled some of the hardier species further south. The count was, for the most part, low, reflecting these conditions.

The eight observers walked short distances to places where a stretch of water could be overlooked, dove back into their cars to get out of the cold, and drove on to the next spot.

Observers were Charles Fallon, Howard Fischer, Susan Kerber, Tom Materfis, Norma and William Siebenheller, Mathilde P. Weingartner, Richard Zain-Eldeen.

Horned Grebe, 28
Double-crested cormorant, 1
Canada geese, 6
Mallards, 390
Black duck, 340
Gadwall, 4
Pintail, 1
Green-winged teal, 2
American widgeon, 10
Total Species: 18

Redhead, 2
Canvasback, 204
Greater scaup, 3768
Goldeneye, 34
Bufflehead, 120
Oldsquaw, 10
White-winged scoter, 2
Red-breasted merganser, 9
Coot, 15
Individuals: 5046

BOTANICAL NOTE: A BALD CYPRESS IN BLOOM

On May 14, 1977, while looking at a bald cypress in the garden of the house at Clinton and Prospect, New Brighton, peculiar structures, pendulous from the ends of many branches at the top of the tree, were observed through binoculars. A telescope being available, we were better able to inspect these drooping shapes.

Dr. Peter Nelson was shown them on the following Thursday. He remarked that it was the first time that he had seen these blossoms which he identified as the staminate blossoms of the tree. The flowers are brownish-purple and droop from the ends of twigs, having the appearance of wilted magnolia blossoms.

—M.P. Weingartner

NESTING RECORD

The first record of nesting pine siskins on Staten Island was established in 1976 when a pair was observed feeding two young at our home in New Dorp. The adults were the remnant of a flock of twenty-five or more birds which had used our thistle feeder during the winter. Several birds from the flock remained through the middle of May, after which time there appeared to be only one siskin coming to feed. This bird came daily until June 6, when the supply of seed was exhausted. The feeder was refilled on June 12 and the bird reappeared within fifteen minutes. It visited daily during the following week and then, on the 19th, was joined by a second adult and two fully fledged young. The two young were then fed by the second adult, and the three left after a few minutes, while the original bird remained at the feeder.

They returned, though, later that day and for four days thereafter. Each time, the juvenile birds flapped their wings and uttered a begging "squawk," and were fed by one of the adults.

Although it is impossible to state categorically—unless the nest is found—that the birds bred here, it is extremely likely. The fact that one bird remained at our feeder throughout late May and early June is consistent with the siskin nesting pattern, for during incubation the female siskin remains at the nest and is fed by the male. After the young are hatched, the same process occurs: male feeds female, female feeds young. Thus the bird at the feeder during that time was probably the male, eating for all.

Siskins are known to travel great distances after nesting. Apparently these birds did so, for they left after the fourth day (June 23) and have not been seen since.

—Bill and Norma Siebenheller

BIG DAY BIRD COUNT May 15, 1977

Aided by a perfect spring day, twenty energetic birders covered the beaches, fields, lakes, marshes and woodlands of the Island from dawn to dusk on Sunday, May 15, in the Island's third annual Big Day Bird Count. Their persistence and skill resulted in the highest total yet achieved in these counts: 143, topping last year's record 134 by a wide margin. Some individual highs were also noted, with Bill Flamm scoring 112 species, the highest he has ever recorded in many years of birding on the Island, and the teams of Bill and Norma Siebenheller and Howard Fischer and Alan Rennie not far behind, with 107 and 106 respectively.

There were a few "misses" and some unexpected finds. Notable by its absence was the field sparrow; it had been heard frequently the week before, singing, and is thought to nest here, but could not be found that day. The chuck-will's-widow, too, was not found in the Pleasant Plains fields where it had been heard each spring since 1974. The "chuck" is on the list, however, due to one of the day's most unexpected events: the flushing of a single female of this species, in mid-afternoon, by Bill Flamm on a slope at High Rock Park. It is arguable whether he, or the bird, was the more surprised at this encounter.

Warblers were particularly plentiful, with twenty-five species seen—an excellent total. Most unusual was the prothonotary warbler found by Stan Caufield at Clove Lakes Park, in mid-afternoon.

At Great Kills Park many species of shorebirds were seen, including five willets. Goldeneye, four males and one female, were sighted off Arbutus beach, a late sighting, and another winter visitor, a common loon, was seen by several participants.

Tom Matterfis saw the day's only woodcock, which he flushed at the Davis Refuge, and he also noted the only yellow-bellied sapsucker, while he was waiting for a bus at Egbert Square! Such are the "lucky breaks" which contribute to a high total.

A list of the birds seen, and of the participants, accompanies this report.

Big Day Birders: Bill Siebenheller, Norma Siebenheller, Tom Matterfis, Stanley Caufield, Bob Clermont, Anna Meyer, Robbie Meyer, Father Henry Traub, Mathilde Weingartner, Richard Zain-Eldeen, Bernard Paul, Sr., Bernard Paul, Jr., Karl Cerasoli, Gloria Deppe, Peggy Sargente, Bill Flamm, Howard Fischer, Alan Rennie, Brian Ruffe, and Charles Fallon.

Common loon
Pied-billed grebe
Double cr. cormorant
Great blue heron
Green heron
Little blue heron
Cattle egret
Great egret
Snowy egret
Black cr. night heron
American bittern
Glossy ibis
Brant
Mallard
Black duck
Pintail
Green-winged teal
Blue-winged teal
Wood duck
Common goldeneye
Hooded merganser
Marsh hawk
Merlin
Kestrel
Ring-necked pheasant
Common gallinule
American coot
Semipalmated plover
Killdeer
Black-bellied plover
Ruddy turnstone
American woodcock
Spotted sandpiper
Solitary sandpiper
Willet
Greater yellowlegs
Lesser yellowlegs
Knot
Purple sandpiper
Pectoral sandpiper
Least sandpiper
Dunlin
Short-billed dowitcher
Semipalamted sandpiper
Sanderling
Great black-backed gull
Herring gull
Ring-billed gull
Laughing gull
Bonaparte's gull
Common tern
Least tern
Mourning dove
Barn owl
Chuck-will's-widow
Chimney swift
Belted kingfisher
Flicker
Yellow-bellied sapsucker
Hairy woodpecker
Downy woodpecker
Eastern kingbird
Great crested flycatcher
Eastern phoebe
Least flycatcher
Eastern wood pewee
Horned lark
Tree swallow
Bank swallow
Rough-winged swallow
Barn swallow
Purple martin
Blue jay
Common crow
Fish crow
Black-capped chickadee
Tufted titmouse
Red-breasted nuthatch
House wren
Carolina wren
Long-billed marsh wren
Mockingbird
Catbird
Brown thrasher
Robin
Wood thrush
Hermit thrush
Swainson's thrush
Gray-cheeked thrush
Veery
Ruby-crowned kinglet
Cedar waxwing
Starling
White-eyed vireo
Yellow-throated vireo
Solitary vireo
Red-eyed vireo
Black and white warbler
Prothonotary warbler
Blue-winged warbler
Tennessee warbler
Nashville warbler
Parula
Yellow warbler
Magnolia warbler
Cape May warbler
Black throated blue warbler
Yellow-rumped warbler
Black throated green warbler
Blackburnian warbler
Chestnut sided warbler
Bay breasted warbler
Blackpoll warbler
Prairie warbler
Palm warbler
Ovenbird
Northern waterthrush
Yellowthroat
Hooded warbler
Wilson's warbler
Canada warbler
American redstart
House sparrow
Bobolink
Eastern meadowlark
Redwinged blackbird
Baltimore oriole
Common grackle
Brown-headed cowbird
Scarlet tanager
Cardinal
Rose-breasted grosbeak
Indigo bunting
House finch
American goldfinch
Rufous-sided towhee
Savannah sparrow
Vesper sparrow
Chipping sparrow
White-crowned sparrow
White-throated sparrow
Swamp sparrow
Song sparrow

—Norma Siebenheller

THE POND SURVEY, STATEN ISLAND, NEW YORK. 1975-1976. PART II

INTRODUCTION: The Staten Island Institute of Arts and Sciences—continuing the tradition of recording natural history which was established with its founding as the Natural Science Association of Staten Island in 1881—initiated a survey of ponds on Staten Island in 1975. Dr. Albert J. Hendricks, Ecologist, and Mr. Hans Behm, Geologist, worked full-time on field and laboratory investigations of viable ponds. The basic references for their study were the Leng and Davis map, "Names and Nicknames of Staten Island," with its guide (originally published in 1896), the 1913 topographical map series, and articles on specific ponds published in earlier PROCEEDINGS. Historical investigation into land use and social history of certain ponds or pond groups was conducted by Mr. Hugh Powell, Staff Research Associate in History.

There were 24 ponds originally investigated; to quote Dr. Hendricks, ". . .most of the ponds having the greatest biologic and geologic interest are located in the more southerly part of the island where there are still great tracts of woods, old fields, meadows, marshes, and open scrubby areas (and) soils or underlying soil strata and parent material are less disturbed than in highly developed areas. . ."

One of the areas on the southwest shore contained ponds in what had once been clay mines. The works done by Dr. Hendricks and Mr. Behm on the clay pit ponds which lie in the Cretaceous area contributed to the decision of New York State to designate two of these ponds as lying within a Unique Area. The report on the pond studies on Cretaceous soils—six in all—has been separately published in 1976 with the cooperation of the New York State Parks and Recreation Commission for the City of New York and constitutes Part I. The reports on the balance of the ponds will appear in the PROCEEDINGS, beginning with Part II which is published in this issue, Volume 29: Number 1.

—G.K. Schneider, Editor

REMARKS about the Collective Ecosystem of Ponds on Terminal Moraine, Low Elevation, in the Southeastern Part of Staten Island.

—ALBERT J. HENDRICKS, PH.D

The natural features of ponds and their environments in this ecosystem are evidently influenced by history and geographic location just as much as by geology of parent materials, soils, and atmospheric conditions. Most of the ponds in this group lie between Amboy Road and Hylan Boulevard and have been greatly affected by these thoroughfares and the roads connecting them. The remaining ponds in the group are located between Hylan Boulevard and Raritan Bay, but closer to the Boulevard than to the salt-water Bay, which seems scarcely to affect these ponds. Contamination by spray driven by heavy windstorms from the bay seldom occurs, either because broad bands of trees and shrubs act as a buffer zone, or simply because of distance from the bay and increasing elevation inland.

The acid sands of the Clay Pit and Chain Pond series*, conditioned and determined by exposure of Upper Cretaceous beds, slow drainage of water, and acid precipitation from New Jersey heavy industry, are not very critical here. Reddish-brown glacial till is exposed on the often steep banks around these ponds and erosion carries silt and clay into pond waters. Leaf litter tends to become soggy before it changes into dark humus and it is not as susceptible to fire as the litter beneath the scrub woods and thickets to the north and west.

Much of the terrain between Amboy and Hylan was subdivided 40 or 50 years ago into street blocks, often including the construction of sidewalks, which, since then, appear to have been left more or less undisturbed. The natural result of comparatively few fires and unintentional disuse has been the development of some secondary woods progressing toward an oak-forest disclimax. At the turn of the century, the deciduous forest on Staten Island could have been referred to correctly as part of the oak-chestnut climax. However, in the subsequent thirty years, the epidemic disease of Chestnut Blight virtually eliminated the American chestnut species from the canopy, thus creating an essentially permanent oak disclimax. Nevertheless, in the course of this survey, quite a few scattered saplings and young trees of American chestnut were seen, some of them bearing fruit, although the seeds inside appear to be shriveled and sterile. Then, too, at the bases of the trunks of most of these low trees, the bark exhibits a cracking and scarring that is supposed to be symptomatic of the blight disease. In any event, in this survey of the ecology of 24 ponds, it is

* See "Cretaceous Ponds,"

only these woods around the ponds of this ecosystem that exhibit a late stage of secondary succession leading to the oak disclimax woods.

Quadrats taken in these woods indicate that sweetgum is the dominant tree in the canopy, followed by sassafras; red, white, and pin oaks. (Further north on the island in a more mature woods, sassafras and white oak are not as important in the canopy.) Dominant woody plants characteristic here of the tall second-story are sweetgum, white oak, arrowwood, pin oak, beech, and sourgum. The short second-story consists mainly of arrowwood, spicebush, pinxter-flower, red maple, white oak, and gray birch. So the admixture of woody plants in all of these horizontal strata is clearly different from that to be found in the ecosystem on ground moraine (see "Cretaceous Ponds," *op. cit.*). Undoubtedly, this last bit of information can be explained by the lack of competition after fires, and the increased inhibition usually provided by a denser canopy characteristic of larger trees in a more mature woods.

When a general consideration of ponds of this ecosystem is made, it may seem that Long Pond, located just southwest of Mount Loretto near Tottenville really represents a transition from the ponds on the southerly ground moraine to those on the lower elevations of the terminal moraine. Next, Acme and Arbutus Ponds, as will be discussed in more detail, seem to be the youngest in this ecosystem, with youth in this context referring to an early stage in the hydrosere. These two ponds are large, have steep till banks on most of their sides, and have a good flow of water through them. Their waters are usually turbid and pondweed productivity is low. Actually, these two ponds might have more in common than present conditions of geography and topography seem to indicate. Evidently, at one time, Acme Pond may have been only a low, marshy area with a stream running through it, debouching into Wolfe's Pond; or, perhaps at one time the whole area might have been a more-or-less continuous stream or pond. So, what is now Acme Pond may earlier have been somewhat influenced by spray or high tides from Raritan Bay, as is still the case to some extent with Wolfe's Pond. In a somewhat parallel fashion, Arbutus Pond, formerly connected to Raritan Bay, is now long cut off from it by a high sandy beach, a weedy meadow, and a densely-wooded buffer zone, which is right at the south end of the pond. What is now Acme Pond is separated from Wolfe's Pond by Hylan Boulevard which may have acted as a dam, permitting the former swamp or marsh to build up into the present pond with a depth of about four feet. At any rate, these two ponds, while far from being really "youthful," still are the youngest in a *hydrarch succession* in this ecosystem. This succession, going from the youngest in the series to the oldest—and almost extinct—is as follows: Arbutus, Acme,

Bunker, Turtle, Little Bunker, and Luten. To be sure, these successional stages do not correspond with chronological age but rather have to do with senescence of ponds that leads to a terrestrial succession which might terminate in climax or disclimax vegetation. It is important in the application of the modern ecosystem concept to remember that populations of fauna, at all levels of magnitude, wax and wane correspondingly with each successional stage of vegetation in a hydrosere.

The last and most northeasterly of ponds in this ecosystem is "Spring" Pond which is perhaps the youngest chronologically, but does not readily fit into the hydrosere outlined above. In fact, this pond seems to owe its recent origin to what appears to be an underground break in a pipe of the municipal water main. The "spring" which has resulted from this break is about twenty yards north of a fire hydrant where Philip Avenue intersects the pond. Its active presence can easily be observed since there is a constant bubbling over the break, and the water around the bubbles is milky in contrast to the clear water of the rest of the pond. According to one long-time resident who lives near the pond, it was only a low-lying swamp up to about ten years ago when a break occurred in the water main which, augmented by frequent clogs of the single narrow conduit outlet under Poillon Avenue, has caused the formation of "Spring" Pond.

LONG POND ECOLOGY

This moderately-sized pond, about 1½ acres in size, lies just north of Calcutta Avenue, approximately half-way between Hylan Boulevard and Amboy Road. Around most of its perimeter the woods come up to the edge of the pond, except in a few slightly more open areas especially near Calcutta Avenue, which is still only a dirt road. Quadrats taken in mid-summer revealed this vegetation profile: the main canopy trees are sweetgum, sassafras, and pin oak, although white and swamp chestnut oaks and sourgum are present. One specimen each of hackberry and white mulberry stand next to the pond, closest to Calcutta Avenue. The tall second story consists mainly of pin oak and sweetgum with some gray birch and red maple. The short second story, for the most part, is made up of arrowwood, highbush blueberry, spicebush, gray birch, and pin oak. An estimated thirty percent of the ground is covered with common catbrier and some sixty percent is open ground with moss patches and thin leaf litter. A few seedlings or low shoots of sweetgum, white oak, and arrowwood were also observed. Uncommonly, a narrow zone of buttonbush intervenes between overhanging trees and the pond. Characteristically, the lower parts of these bushes are in the pond shallows. A very few specimens of swamp-loosestrife and a false

loosestrife were observed growing near the buttonbush. Low, open spots exhibited spike rush, St. John's-wort, and a few specimens of meadowbeauty. In the water, a rich and extensive carpet of water milfoil was estimated to cover ninety percent of the pond-bottom, while large colonies of bladderwort floated just beneath the surface of the water and, at the height of summer 1975, appeared to cover ten to twenty percent of the water's surface. Faunal life of all sizes was represented: presence of opossum was noted, as well as that of the gray squirrel and the eastern chipmunk. Early in August a great blue heron was seen wading in the shallows, and a week or so later what appeared to be a young black-crowned night heron was seen flying from branch to branch among trees at the pond's edge. Numerous bullfrogs were heard along the pond's banks, and hundreds of their large tadpoles were observed in the water. Dragonflies and damselflies flashed through the air in considerable numbers, while water striders, whirligig beetles, water boatmen, and other water insects hurried around below.

In the water were numerous quantities of small green sunfish, and some leeches and some black-and-white mites. Some nymphs of mayflies were seen amid colonies of coarse alga filaments. At a macroscopic level, thousands of cyclops, seed shrimps, and water fleas carried on their various activities. At a microscopic level, the most prominent organisms noted were quantities of a one-celled green alga, and a filamentous green alga with a blue-green alga growing epiphytically on its filaments. It is likely that the biotic diversity and pondweed productivity of this pond is related to its slightly alkaline water (pH 7.4), its high iron content (3-plus m./1), and other features such as a good dissolved oxygen/carbon dioxide ratio (9-4/mg./1.), and other chemical ingredients. Comparison of the water chemistry of ponds of this ecosystem has been made to those of the series on ground moraine. In general, water chemistry values of these ponds indicate a better environment for biotic diversity than those ponds on ground moraine with spottily exposed Upper Cretaceous sands and clays. However, it should be noted that Long Pond, toward the end of summer, had large quantities of methane gas trapped between soil layers on the pond bottom. Wading in the pond and poking the bottom with a pole caused large quantities of odorless gas bubbles to rise to the surface. This gas could be ignited with a match. Since hydrogen sulfide values for the pond were found to be low, it was thought that the flammable gas was methane. Methane gas is not uncommon in many alkaline ponds in the late summer. This "marsh gas" is caused by anaerobic bacterial decomposition of organic materials trapped in sediment beneath the water. Just what the effects of this gas were on aquatic organisms, especially animals, was not

clear. There were no big fish present, nor was there any fish diversity although some minnows of unidentified species were glimpsed.

Vascular Plants identified at Long Pond and/or on the Terminal Moraine:

ACERACEAE.	*Acer rubrum* L.	red maple
BETULACEAE.	*Betula populifolia* Marsh.	gray birch
CAPRIFOLIACEAE.	*Viburnum dentatum* L.	arrowwood
CORNACEAE.	*Nyssa sylvatica* Marsh.	sourgum
CYPERACEAE.	*Eleocharis olivacea* Torr.	spike rush
ERICACEAE.	*Rhododendron nudiflorum* (l.) Torr.	pinxter-flower
	Vaccinium corymbosum L.	highbush blueberry
FAGACEAE.	*Castanea dentata* (Marsh.) Borkh.	American chestnut
	Fagus grandifolia Ehr.	beech
	Quercus alba L.	white oak
	Q. michauxii Nutt.	swamp chestnut oak
	Q. palustris Muensch	pin oak
	Q. rubra L.	red oak
HALORAGACEAE.	*Myriophyllum humile* (Raf.) Morong	water milfoil
HAMAMELIDACEAE.	*Liquidambar styraciflua* L.	sweetgum
HYPERICACEAE	*Hypericum virginicum* L.	St. John's-wort
LAURACEAE.	*Lindera benzoin* (L.) Blume	spicebush
	Sassafras albidum (Nutt.) Nees.	sassafras
LENTIBULARIACEAE.	*Utribularia fibrosa* Walt.	bladderwort
LILIACEAE.	*Smilax rotundifolia* L.	common catbrier
LYTHRACEAE.	*Decodon verticillatus* (L.) Ell.	swamp-loosestrife
MELASTOMACEAE.	*Rhexia virginica* L.	meadowbeauty
MORACEAE.	*Morus alba* L.	white mulberry
ONAGRACEAE.	*Ludwigia shpaerocarpa* All.	false loosestrife
RUBIACEAE.	*Cephalanthus occidentalis* L.	buttonbush
ULMACEAE.	*Celtis occidentalis* L.	hackberry

Non-vascular Plants identified at Long Pond and/or on the Terminal Moraine:

CHLOROPHYTA.	*Protococcus* sp.	green algae
	Spirogyra sp.	green algae
	Spondylosium planum	green algae
CYANOPHYTA.	*Microchaete diplosiphon*	blue-green algae

Readily visible animals at Long Pond and/or the Terminal Moraine:

MAMMALIA.	Marsupialea. *Didelphis marsupialis*	opossum
	Rodentia. *Sciurus carolinensis*	gray squirrel
	Tamias striatus	eastern chipmunk
AVES.	Ardeida. *Ardea herodias*	Great blue heron
	Nycticorax nycticorax	black-crowned night heron
PISCES.	*Lepomis cyanellus*	green sunfish
ARTHROPODS.	Arachnida. Acarina. *Hygrobates longipalpis*	mites
INSECTA.	Coleoptera. Gyrinidae. *Dineutes americanus*	whirligig beetle
	Ephemeroptera. Baetidae. *Baetis spiethii*	small mayflies
	Hemiptera. Gerridae. *Gerris marginatus*	water strider
	Corixidae. *Arctocorixa interrupta.*	water boatman
	Odonata	dragonflies
	Lestidae. *Archilestis* sp.	damselflies

Animals of Small magnitude at Long Pond and/or the Terminal Moraine:

CRUSTACEA.	Cladocera. *Daphnia* sp.	water fleas
	Pleuroxus denticulatus	*water fleas*
	Copepoda. *Cyclops bicuspidatum*	cyclops
	Ostracoda. *Cyrinotus incongruens.*	seed shrimp
	Hirudinea. *Helobdella stagnalis*	leeches

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—A.J.H.

THE PLEISTOCENE EPOCH

—Hans J. Behm

The Pleistocene ice age began about two to three million years ago and ended about 10,000 years ago, although some authorities contend that we are at the midpoint of an interglacial stage, or fourth interval, to be exact. This paper, however, focuses attention on the description and the geomorphic characteristics of the various glacial deposits typical of Staten Island.

The Pleistocene continental glacier carried with it the remnants of the products of weathering, leaving various deposits in its south-southeasterly movement. A diversity of all sizes and kinds of rock fragments were incorporated into the glacier and its foot which

became a powerful agent of erosion, polishing or scratching, and shaping the underlying bedrock as it moved forward, or retreated, if the melting rate was greater than its advance. Terminal and ground moraines were laid down with associated geomorphic features: kames, eskers, erratics. While the landscape was being eroded, the bedrock was partially or completely obscured by new deposits which bore no relationship to it; they had their origins in northern New Jersey, upstate New York, and Canada, and helped to create entirely new drainage systems and watersheds. As the vast glacier was subjected to ablation, sea levels rose gradually and brought into being many of the familiar waterways and estuaries in the metropolitan area, isolating many spots and transforming them into islands.

On Staten Island the ice cap may have reached a thickness of 500 feet or more. Most of the observable glacial deposits were left behind by the advance the Wisconsin last ice sheet. Many of the previous deposits on the island were carried away or obliterated.

The terminal moraine is an irregularly winding ridge of glacial till that makes its first appearance at Fort Wadsworth near the Narrows, and represents the continuation of the Harbor Hill moraine across the Narrows from Long Island. From the Narrows on, as seen from a plane, the terminal moraine continues as a relatively wide band, contracting as it runs west, turning sharply south in Dongan Hills. It broadens again as it continues southwestward, reaching its greatest width at Eltingville/Annadale. Once more it narrows, its width remaining constant as it runs southwestward toward Tottenville.

Topographically, the terminal moraine consists of irregular and hummocky ridges and hillocks visible at the Narrows, Arrochar, and High Rock Park, and once again prominently displayed in Annadale, Huguenot, Prince's Bay, and Tottenville. The highest elevation is a little more than 150 feet above sea level at Fort Wadsworth, while other conspicuous hillocks of 100 feet or less are present in Arrochar, Eltingville, Annadale. Mount Loretto rises to more than 70 feet above sea level, standing out prominently in Prince's Bay in an area of relatively low relief. A rather abrupt and steep bluff is present at its southwestern margin overlooking Raritan Bay. Erosion has been marked at the seaward side of the bluff which is composed of rather loosely compacted glacial till and glaciofluvial deposits. Beneath the glacial overburden, an exposure of Upper Cretaceous sands and clays (the Magothy? Formation), is present.

As the Wisconsin ice cap began to retreat, large pieces of the stagnant ice cap broke loose, became embedded in the underlying glacial tills, and melted, creating the numerous depressions called "kettles," now largely occupied by ponds and swamps. On the other hand, fluvial erosion created many small valleys and estuaries as sea

level was nearly stabilized. Seguine's, Arbutus, and Wolfe's Ponds occupy these former estuaries, which are aligned parallel to the direction of the glacier's movement.

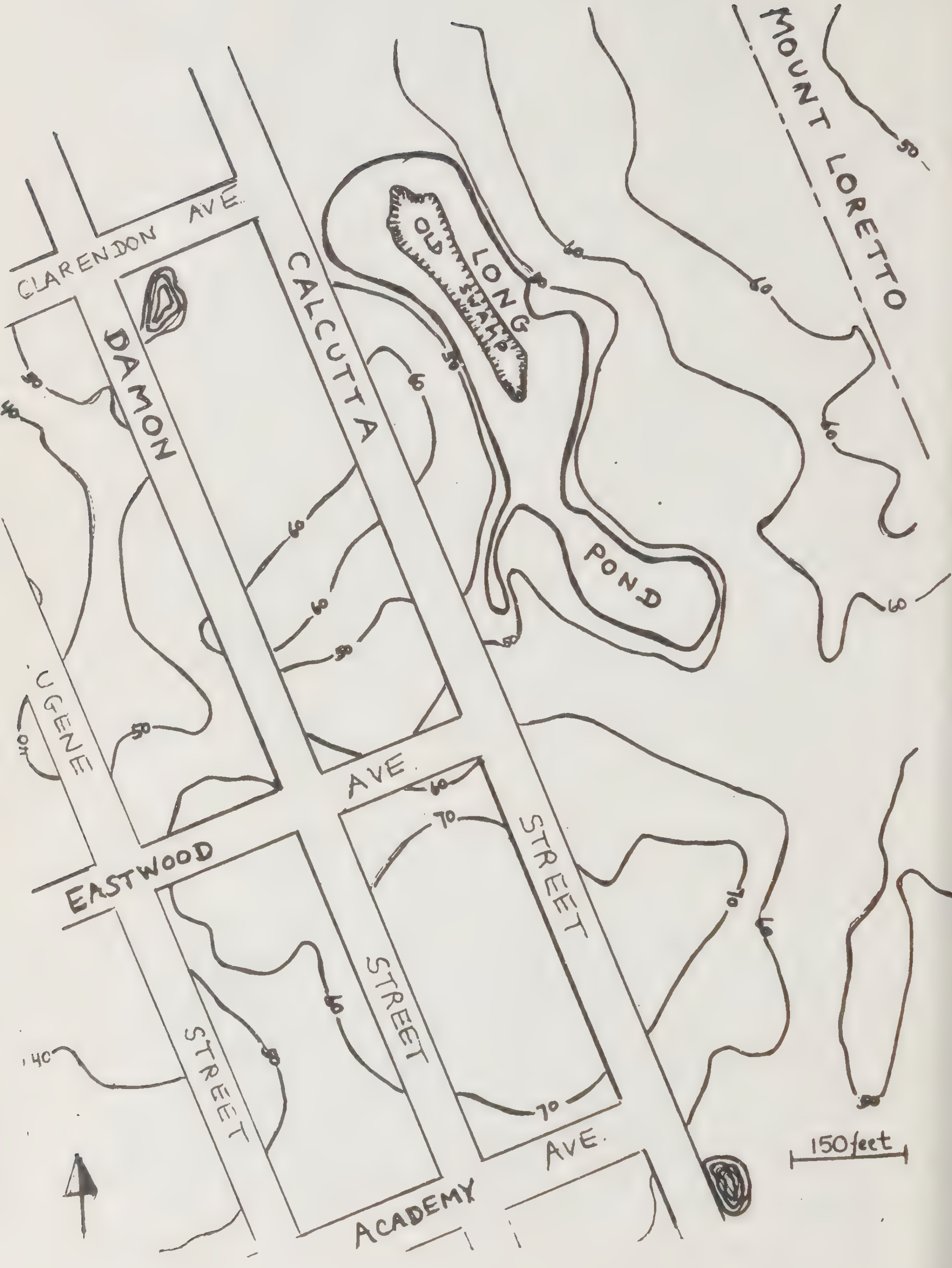
The glacial deposits around and beneath the ponds consist of a heterogeneous mixture of all sizes, with a wide spectrum of composition, offering many types of metamorphic, sedimentary, and igneous rocks, exhibiting all stages of weathering, angularity, and degree of roundness. The provenance of most of the rock fragments is not local, nor does this transported regolith reflect underlying rock composition. The thickness of the deposits varies greatly, being thickest within the end moraine and thinner in the outwash area and ground moraine where some places may be relatively free of glacial debris, even exposing bedrock. Some of the deposits are highly compacted, while "hardpans" occur wherever clay is an abundant constitutent of glacial till. The till to the rear of the end moraine is typical with occasional interbedded glacio-fluvial deposits, variously tinted in shades of red and brown by the iron oxides present in the transported shales and sandstones of the Newark series.

Scratched and faceted pebbles, cobbles, and boulders which are variously rounded, sub-rounded, subangular, equidimensional, or elongate, are present in the terminal moraine and northwest of it. Most larger constituents are rounded and subrounded, but smaller sizes show an increasing angularity because they have less surface for exposure and are less affected by abrasion. Some till shows faint traces of stratification due to the fluvial processes initiated by temporary melting of the ice. Elsewhere, the till is thoroughly compacted. In a few places, the glacial deposits have undergone considerable cementation with iron oxide, which is present in varying amounts in these deposits.

Long Pond Geology

Long Pond is located between Clarendon Avenue (N) and Eastwood Avenue (S), adjacent and parallel to Calcutta Street. The pond is about 800 feet long by 300 feet wide at the northern terminus, irregular in shape and generally much narrower elsewhere, with its overall surface area being about ¾ acre. Pond depth averages from two to three feet—one spot at the narrow southern end measured four feet deep at examination. A dense growth of vegetation chokes both northern and southern ends. The pond is not shown on the 1887 Staten Island Atlas, nor on the 1913 topographic series, neither does it appear on the rock line map series published for the WPA and Columbia University in 1937. A fresh-water swamp is shown at this site.

The color of the water varied from brown to amber and often was


MOUNT LORETTO
CLARENDON AVE.
DAMON
CALCUTTA STREET
OLD LONG SWAMP
POND
UGENE
EASTWOOD AVE.
STREET
STREET
ACADEMY AVE.
150 feet
40
50
60
70

muddy, making it difficult to obtain meaningful secchi disk readings. After heavy rains (1975), the turbidity was high from the influx of the clayey portion of the sediments derived from the nearby glacial till banks. On stepping into the pond to collect samples, the bottom was felt to be partially covered with a thick mat of vegetation which had been buried in some places with fine particulate matter. If these layers were disturbed, much methane or marsh gas (CH4) was emitted.

Geologic Setting: The pond is bordered by low banks of classical Wisconsin drift, showing a particle-size range from less than 1/256mm to more than 256mm, including varieties of gneiss, granite, basalt, red shales and sandstones of the Newark group; yellow, white, rusty-white, and jasperoid pebbles; conglomerate, schist, and quartzite. The high rainfall during the summer (1975) brought about the formation of new drainage patterns such as deeply eroded gullies, running from the abandoned dirt road (Calcutta Street) which is littered with broken remains of concrete sidewalks. This voluminous movement of sediment caused many small, deltaic deposits to form which extended from 10 to 20 feet into the pond, burying much decaying vegetable matter, and trapping more marsh gas.

The pond's bottom muds are superimposed upon what appear to be clayey and micaceous sands of the Upper Cretaceous. Apparently, the glacial till is not very thick in this area and extensive reworking of glacial constituents and Upper Cretaceous has taken place.

The stratigraphic sequence beneath the pond is: Upper Cretaceous, grayish- and yellowish-brown sands; mixed facies of Upper Cretaceous and Pleistocene till constituents; heavy, blackish organic muds; thick, deocmposing plant debris with marsh gas; deltaic deposits consisting of clay, silt, and fine sand nearer the shore areas.

The outflow is located at the eastern side of the northern tip of the pond which has been dammed with glacial and other debris to reduce the outflow and create the pond. The 1896 Leng & Davis map shows Mill Creek branching from this spot southward to join the Mill Creek shoals of the Arthur Kill. Although no pond is shown on this map, the location of the outlet suggests Mill Creek as the outlet.

The soil layer is very thin, even lacking in places, some of which are moss-covered. Current ripple marks along the shore of the pond were noted.

Fungi: These higher fungi were recorded: *Russula foetens* (Pers.) Fr., *Scleroderma aurantium* Pers., growing largely on moss; *Collybia* (Fr.) Quel., *Peziza* (Dill.) L., and *Panaeolus* Fr.

Comments: the area is refuse- and garbage-littered and abandoned cars and/or car parts lie in the pond and along its edge. People using the area for recreation in the summer months add their contributions, unfortunately.

L O N G P O N D

Sample Depth Records (water)

S_1 = 24"

S_2 = 30"

S_3 = 42"

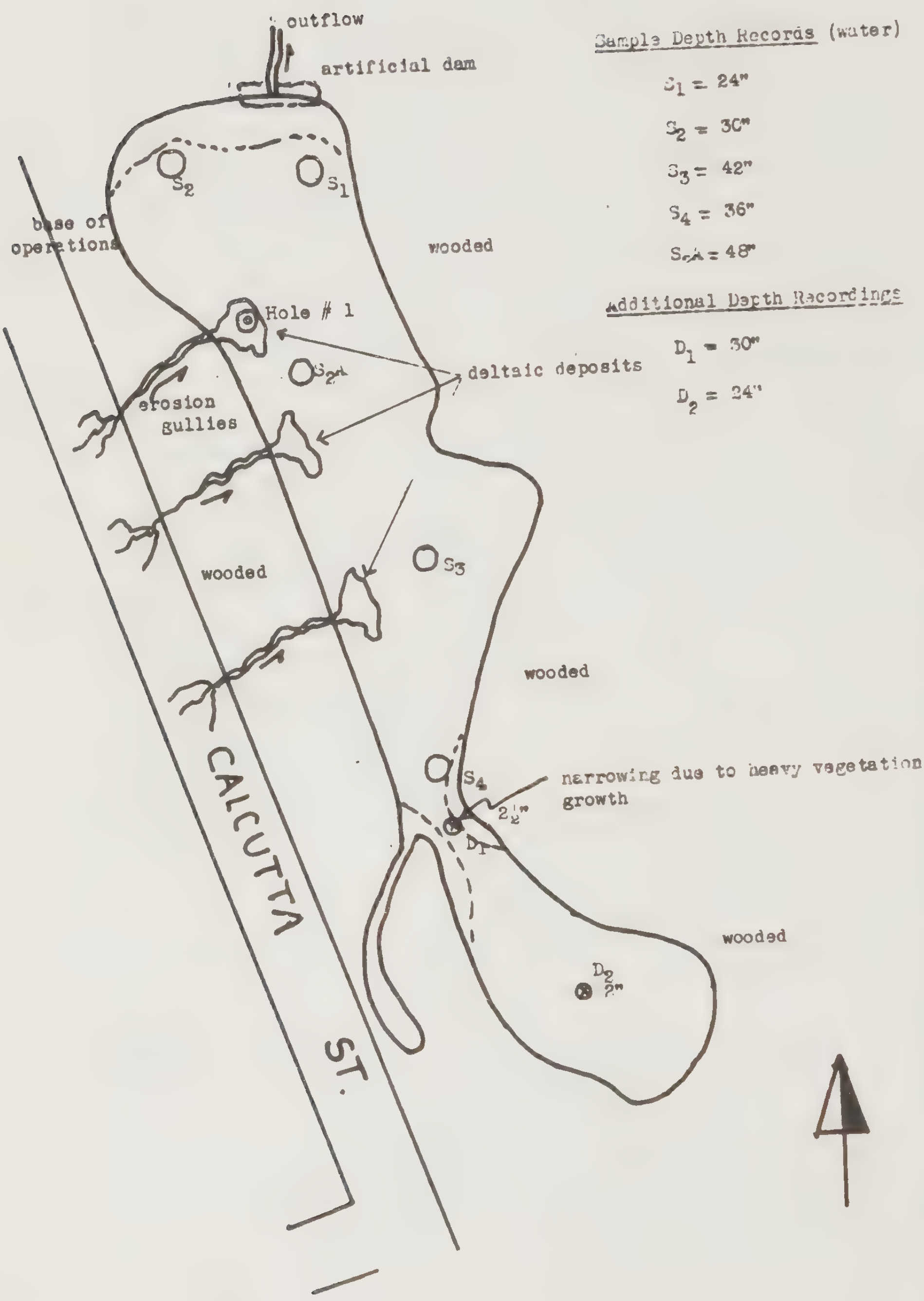
S_4 = 36"

S_{2A} = 48"

Additional Depth Recordings

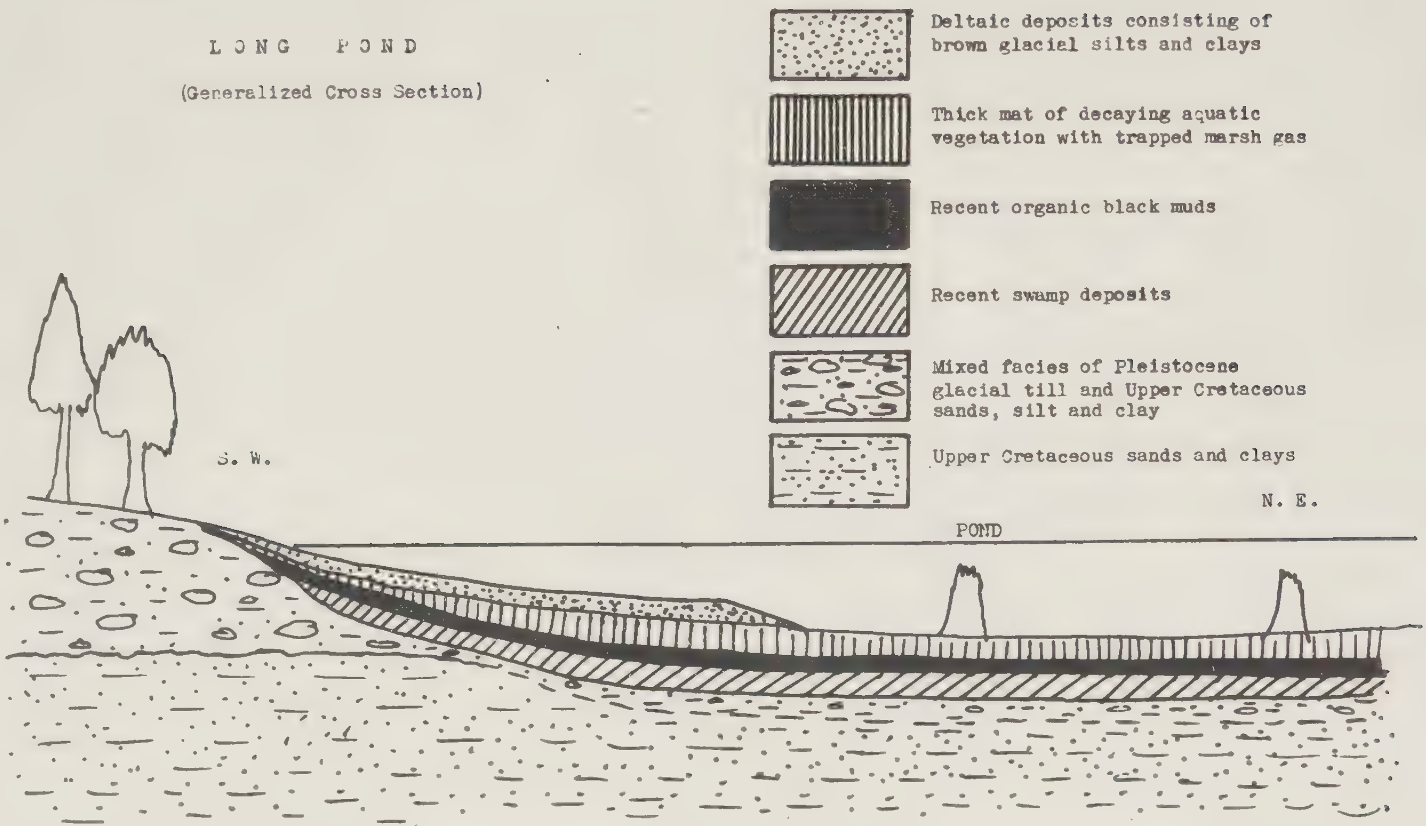
D_1 = 30"

D_2 = 24"



LONG POND

(Generalized Cross Section)



Microscopic Description of Sediments: Clear, transparent, and glassy quartz, largely angular and subangular, is abundant. A few rounded and subrounded grains are included. Milky-white quartz, mostly angular to subangular, including a few subrounded grains, is also present. Residues revealed reddish quartz, much white mica, a few flakes of deep-green mica, some white and pinkish feldspar, fragments of gneiss and granite, light-, deep-, and brownish-green glauconite, rusty and ochraceous grains of limonite, brown jasper, a few basalt fragments, and a few grains of garnet. In addition, there were fragments of red shale and pinkish-red sandstones of the Newark Group (Upper Triassic), which were angular, subangular, and subrounded.

Microscopic Description of Faunal and Floral Constituents. The dredged samples revealed a high percentage of plant debris including a variety of insect parts and seeds. Some of the debris was carbonized: the periphyton samples were badly contaminated with black carbonaceous material, including charred wood. The sediment samples also contained rusty material, a burned, coke-like residue, some glass fragments and a few plastic grains. In addition, there was a high percentage of fly ash in the probes, indicating heavy pollution of the area. (This is an island-wide problem. Ponds serve as natural traps for particulate outfall produced by industrial activity along the Arthur Kill on the New Jersey shore. Such contaminants were found in other ponds such as Porzio's, Sharrott's, and the Chain Series.*) The bottom samples collected are grayish-black because of the high concentration of fly ash, but the deeper auger probes provided cleaner samples. Testacida in the samples proved to be *Arcella vulgaris* Ehrenberg.

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PROCEEDINGS

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CONTENTS

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BREEDING BIRDS OF 1977

by Norma and William Siebenheller

Fifty-nine species of birds were confirmed as current breeders in a survey conducted last year by the active birders of Staten Island. As much as possible, proof was sought in the form of a nest, newly-fledged young, or parent birds carrying food. Where such proof was unavailable, a consensus of opinion by the participants in the survey determined whether a species was to be included in this list.

We were admittedly conservative, and we believe that with diligent effort during the next few seasons at least ten more species will be proven to breed on the island. We will publish such additions as they are discovered.

Those established in 1977 are:

1. GREEN HERON. Small numbers are seen throughout the season, and young birds from midsummer on, in a variety of locations such as South Shore ponds and landfill waterways. No nests were found, but we agree that this species undoubtedly continues to breed here as it has in the past.

2. CATTLE EGRET. A sizable number of cattle egret nests were discovered at Shooter's Island in a mixed heronry there.

3. SNOWY EGRET. These birds were also found nesting at Shooter's Island during a visit there in May.

4. BLACK-CROWNED NIGHT HERON. Eggs and nests were discovered in the Shooter's Island heronry where there may be four dozen or more pairs breeding.

5. GLOSSY IBIS. These recent arrivals were confirmed as breeders for the first time with the discovery of many pairs at Shooter's Island.

6. MALLARD. Mallards nest wherever suitable habitat is available, and a female with young in tow was a common sight in May and June.

7. BLACK DUCK. Adults with young were seen at the Travis marshes in July, and at landfill ponds during the same month.

8. WOOD DUCK. We had numerous reports of wood ducks throughout the spring and summer at various South Shore ponds, particularly in the Huguenot area. No young were seen, but the frequency of occurrence strongly suggests that these birds are indeed breeding here.

9. KESTREL. Kestrels nest in various locations on the Island. A nest was found in Port Richmond, and adults with young observed at Mount Loretto.

10. RING-NECKED PHEASANT. This introduced bird is a prolific breeder wherever conditions are right. Young were sighted, with adults, at Tottenville, Richmondtown, Buck's Hollow, Latourette, and many other locations.

11. COMMON GALLINULE. These birds have been observed breeding on the Island for several years now, with many pairs of adults and numerous young seen at the Goethals Bridge Pond, and at other locations in the West Shore marshes.

12. KILLDEER. Many pairs of killdeer bred in various locations, including South Beach, Great Kills Park, and the landfill.

13. AMERICAN WOODCOCK. The courtship performance of this interesting species was observed in April on Latourette Hill, behind St. Andrew's Church. No eggs or young were seen this year, but a family was discovered in May 1974 in Buck's Hollow, and adults were flushed periodically throughout the season from a variety of boggy spots.

14. HERRING GULL. A colony of these adaptable birds was found on Swinburne Island in 1964, and although no visits have been made to the Island in recent years we have no doubt that the species continues to breed there undisturbed.

15. MOURNING DOVE. These slow-moving birds are abundant in parks and backyards. A nest was discovered and photographed in Clove Lakes Park.

16. SCREECH OWL. This owl has, in recent years, resisted efforts to find its nest, but it is sighted throughout the year and we do not doubt that it continues to breed here.

17. WHIPPOORWILL. Not so commonly heard as in previous years, this species is declining though it undoubtedly continues to breed in small numbers. One was noted calling nightly on Rossville Avenue into July.

18. CHIMNEY SWIFT. Swifts were seen throughout the summer although no nests were found. Many were seen circling the abandoned buildings at Sea View on May 30 and may have bred there, in the available chimneys.

19. BELTED KINGFISHER. A pair was seen through the summer on the West Shore, and birds were noted circling the cliffs at Mount Loretto where they have been known to nest in the past, so there seems little question that this species may still be considered a breeder.

20. COMMON FLICKER. Many nests were found —at the Goethals Bridge Pond, Davis Refuge, High Rock Park, Bunker Pond, etc.—as this species continues to thrive on Staten Island.

21. HAIRY WOODPECKER. Small numbers of these birds still breed here. A pair was seen carrying food along Richmond Brook near St. George Road on July 13.

22. DOWNY WOODPECKER. These birds are common nesters in all our woodlands. A nest was observed in Davis Refuge, and another at Clove Lakes —only two of many.

23. EASTERN KINGBIRD. Adults were seen in early summer at Arbutus Lake, where a family had been noted in July 1976. No doubt they breed there and in at least several other localities as well.

24. GREAT CRESTED FLYCATCHER. No definite proof was obtained this year, but the bird was seen and heard throughout the summer in sections of the Greenbelt, and we consider it still a breeder as it has been in the past.

25. HORNED LARK. Territorial behavior was noted among the larks at Great Kills Park as early as March, while a fledgling was seen on April 8 on the dunes there.

26. TREE SWALLOW. Seen entering purple martin houses at the Goethals Bridge Pond, and later feeding young over the water there, these birds may certainly be considered breeders.

27. ROUGH-WINGED SWALLOW. Nests were found in the drainage pipes of the Lemon Creek Bridge on Hylan Boulevard, and in the Mount Loretto cliffs not far away.

28. BARN SWALLOW. Nests were discovered in many places: under the Lemon Creek Bridge, at the Travis Avenue Bridge, near Mount Loretto and near the Goethals Bridge. There were undoubtedly many more.

29. PURPLE MARTIN. 61 pairs bred in 1977 at the famous colony established by Howard Cleaves at Lemon Creek.

30. BLUY JAY. Every neighborhood has its resident blue jays, and many of them nest in ornamental evergreens. Still others breed in our woodlands.

31. COMMON CROW. Crows nested in many places in 1977, though perhaps the most interesting was one at Clove Lakes Park: it was in the Bartram's Oak planted there by William T. Davis.

32. BLACK-CAPPED CHICKADEE. Chickadees were seen excavating nests at many points in High Rock Park and Buck's Hollow, and were noted in many other Island woodlands as well.

33. TUFTED TITMOUSE. The distinctive call of this species rang through many Island localities in the spring. Adults were seen feeding young in Buck's Hollow in mid-July.

34. WHITE BREASTED NUTHATCH. Nests are seldom found for this nuthatch, but one was seen entering a tree cavity near Walker Pond in May, and we are confident that this species continues here, though not in large numbers.

35. HOUSE WREN. Among our most abundant woodland nesters, house wrens were heard in all sections of the Island. They occupied seven of the eight bluebird houses erected in Buck's Hollow (the eighth was empty).

36. LONG-BILLED MARSH WREN. Some of these once-abundant birds still nest in our West Shore marshes, where they could be heard regularly in June and July.

37. MOCKINGBIRD. One of our commoner resident birds, the mocker can be heard in every neighborhood in spring. A nest was found in the Davis Refuge.

38. CATBIRD. Almost every thicket seems to have its catbird. Nests were found in Davis Refuge and at High Rock, but there were many, many more.

39. BROWN THRASHER. Seen and heard widely, thrashers are common woodland breeders. A nest, from which four young were fledged, was found in High Rock Park.

40. AMERICAN ROBIN. A very common breeder both in parks and backyards, the robin thrives all over the Island. Nests were found in Clove Lakes Park, in Oakwood on a residential street, and in Moravian Cemetery.

41. WOOD THRUSH. The melodic song of this species could be heard throughout the season in various Island woodlands. No nests were found, but we have no doubt that many pairs bred here.

42. STARLING. These introduced birds breed here by the thousands, to the detriment of many native species, particularly the eastern bluebird.

43. YELLOW WARBLER. This warbler still breeds here in a few isolated locations. A pair was noted this year in Davis Refuge; the year before, in Great Kills Park.

44. OVENBIRD. Several ovenbirds could be heard at High Rock Park and other Greenbelt locations during the season, indicating that this species still breeds in at least several places.

45. YELLOWTHROAT. This is the only warbler species that breeds widely here at this time. No nests were found, but yellowthroats were heard at Great Kills Park, High Rock Park, the Travis marshes, Davis Refuge, Goethals Bridge Pond, the landfill ponds, and many other places.

46. HOUSE SPARROW. These birds are ubiquitous in residential neighborhoods, raising several broods each season.

47. EASTERN MEADOWLARK. A nest was found at Mount Loretto this year and it is suspected that meadowlarks may also breed in the fields at South Beach, where they are seen periodically throughout the season.

48. RED-WINGED BLACKBIRD. Redwings are abundant here and nest widely in our swamps and marshes. Nests were discovered at Travis, and at Loosestrife Swamp in High Rock Park.

49. NORTHERN ORIOLE. Although they did not appear in some places where they had previously been known to breed, we have little doubt that orioles continue to nest here. Their hanging baskets are often seen in winter, when trees are bare of leaves.

50. COMMON GRACKLE. Grackles bred in many locations. A colony was found in a grove of evergreens near the Egbertville Ravine, and individual nests were discovered in several other places.

51. BROWN-HEADED COWBIRD. A few of these birds were sighted during the breeding season, and we can assume they were laying their eggs in local nests.

52. CARDINAL. Quite a common bird here, the cardinal nests in backyard and woodland alike. A pair bred in rhododendrons in Moravian Cemetery, while adults were observed feeding young at Davis Refuge in July.

53. INDIGO BUNTING. This species is considered "very probable" although no nests were found. Singing males were heard until mid-July at High Rock Park, in Moravian Cemetery, along Manor Road, and in Buck's Hollow.

54. HOUSE FINCH. House finches have been breeding here only since the mid-1960's, but have established themselves widely and nest in a variety of situations. A nest was found at Great Kills Park, and many fledglings were seen at feeders.

55. AMERICAN GOLDFINCH. Goldfinches are seen through the summer in many Island locations and nest at, among other places, Great Kills Park. A nest was found there in 1976.

56. RUFOUS-SIDED TOWHEE. These secretive birds are more common than is often realized, and they nest in all of our woodlands. No nests were found, but fledglings were seen at a feeder in Eltingville in July.

57. FIELD SPARROW. Adults were seen carrying food in June behind St. Joseph by the Sea High School, and another pair similarly engaged was noted in Buck's Hollow in July. We do not doubt that many others, as well, bred in brushy fields in various sections of the Island.

58. SWAMP SPARROW. Swamp sparrows were heard singing frequently during the season in the West Shore marshes, and a pair is known to have bred at Davis Refuge.

59. SONG SPARROW. This species is abundant in a variety of Island habitats. A nest was found on the slopes of Arbutus Lake on May 28, while adults carrying food were seen commonly in residential areas and parks.

CONCLUSION

The fifty-nine species designated above comprise an encouraging list. It is evident that despite increasing urbanization, Staten Island still retains an abundant and healthy bird population, and that while we have seen some species disappear for various reasons, we have a number of recent arrivals to balance this loss. We look forward to such additions as the barn owl, American bittern, American coot, red-eyes vireo, and others, as we seek to prove what we now strongly suspect. The final totals should top sixty-five by autumn 1978.

AULACODISCUS SPECIES IN MORAVIAN TEGEL—II

by Joseph F. Burke and Warren E. Flint

BRNO (BRÜNN)

(With reference to a previous article, in the Proceedings Staten Island Institute of Arts and Sciences, 28:40, December 1974.)

It was suggested that "Typen Platten" of Tegel diatoms, prepared by E. Thum, might still exist. On March 17, 1977 Mr. R. Ross, Keeper of Botany, British Museum (Natural History), London, England, wrote that such a slide was in the Museum collections, No. BM 15463. The slide has over 200 specimens. The top row consists of 12 diatoms, the first 8 of which are Aulacodiscus. Mr. Ross confirms the eighth specimen is *Aulacodiscus argus*. The position of the specimen, as the eighth in the top row of twelve, would indicate it had been mounted by Thum as part of the flora of the Tegel deposit. Four other specimens of *A. argus* are offset at the corners as markers. It would not follow, necessarily, that the four marker specimens were from the deposit.

PŘIBICE (PRIBITZ)

This is a further sample that probably became available through Chenevière. An examination has been made of twelve strewn slides prepared by the late R.F. Lawrence, New York, from material he had received from A. Elger, Eutin, Holstein.

Two species of Aulacodiscus are present on the slides:

A. grevilleanus Norman ex Greville
A. lunyacsekii Pantocsek

There are eleven specimens of *A. grevilleanus*, two of which are entire and the others are in fragments. Eight of the specimens appear singly on eight of the slides; a ninth slide has three fragments on it.

A. lunyacsekii is present as single specimens on five of the twelve slides.

The ratio of the two species, on the twelve slides, is eleven of *A. grevilleanus* to five of *A. lunyacsekii.*

THE POND SURVEY, STATEN ISLAND, NEW YORK 1975-1976. Part III.

Arbutus Lake and Acme Pond

by Albert J. Hendricks, Ph.D.

The terrain and vegetation around these two ponds show strong resemblances, except that the south end of Arbutus Pond has a large number of introduced shrubs and trees that form a dense woody buffer zone between the pond and the sandy field that leads to Raritan Bay. Around both ponds, slopes are typically steep with much reddish till exposed. Here and there, wide gullies have formed small mud flats that project a little out into the water. Herbaceous or semi-woody vegetation tends to form on these mud flats, while shrubs, vines, and scrubby trees occupy much of the gullies. It should be noted, however, that the south and eastern ends of Acme Pond are delimited by low flats that suddenly rise steeply to form the shoulder of Hylan Boulevard. In all probabilty, the entire lowland here was a swamp before road-building provided inadvertent dams to impede water flow. The woods in this low area has sweetgum, pin oak, and red maple as predominant trees in its canopy, with mostly arrowwood in its tall second story, along with some specimens of sweetgum, high bush blueberry, and sourgum. The short second story is also predominantly made up of arrowwood, although red maple saplings are fairly numerous. Also, some chokecherry, maple-leaf viburnum, and pin oak plants are present. The ground cover consists mainly of quite numerous common catbrier stems forming tangles on the ground, or clambering among shrubs or on low branches of trees. Literally thousands of false Solomon's-seal herbs are scattered across the otherwise heavily leaf-littered ground.

A sample of the woods along a slope of Arbutus Pond showed sassafras, red oak, and sweetgum as the main trees in the canopy, although a few paper birches were noted. The predominant plants of the tall second story were found to be red oaks, pin oaks, chokecherries, and sourgums. Some specimens of the ornamental Norway maple were seen. The short second story was identified as a mixture of arrowwood, hardhack, sourgum, red oak, spicebush, and Norway maple. An estimated seventy percent of the ground area in the quadrat was covered by a thick leaf-litter, while the remaining cover consisted of a mixture of seedlings or young plants of sassafras,

Norway maple, arrowwood, red oak, and others. Poison ivy vines were numerous, and Virginia creeper was present. Also seen were some specimens of the woody vine, American bittersweet.

An outstanding example of invasion of a "youthful" pond by shrubs is the very extensive colony of rose mallow on the north side of Acme Pond, which borders on a low area that is part marsh and part wooded swamp. Anyway, these rose mallows have formed a dense stand, two to three hundred feet long, and perhaps just as deep, which projects into the pond. This semi-woody plant is a perennial from its root system. Each season, new vertically growing canes in dense clusters manage to attain heights of up to six feet or more, and produce pink or white flowers as big as saucers. On the pond-side edge of this large colony, a few scattered shrubs of buttonbush, arrowwood, swamp rose and silky dogwood were observed.

At the bases of these shrubs, where a little soil and litter had accumulated, a few ferns such as cinnamon fern and sensitive fern could be seen. Some unidentified bits of grasses, sedges, and mosses also grew as pioneers in these little bits of soil. Another smaller colony of rose mallow was seen in the southwest corner of the pond in association with arrow arum, swamp milkweed, mild water pepper, St. John's-wort, tussock sedge, and other low growing sedges and rushes. Numerous floating drifts of big duckweed were scattered across the pond's surface, along with occasional floating masses of a filamentous green alga. Ordinarily, throughout the growing season Acme Pond was turbid—of an olivaceous, muddy appearance. After a very heavy rainstorm it would take on the brick-red hue of the steep hills on its sides. Naturally, this turbidity has had its effect on the volume of pondweeds growing out in the water. In fact, submerged pondweeds, rooted or free-floating, were virtually non-existent, although some individuals of one of the false loose-strife species were found. As commonly found elsewhere, numerous dragonflies, damselflies, water striders, water boatmen, and other pond-habitat insects were observed. Fishermen seem to like the pond, and were found especially to seek black bullheads. The pond contains numerous small green sunfish in its shallows, and has a smaller quantity of bluegills. Snapping turtles, some of good size, were observed to live in the pond, as well as some smaller kinds like the painted turtle. Macrofauna collected included a number of hydra and myriads of *Diaptomus oregonensis* (copepoda), in addition to *Daphnia pulex* and *Rosmina coreconi* (both in Cladocera). Microscopic animals feeding among the coarse filaments of *Rhizoclonium* alga included *Testudinella patina, Sinantherina* sp. (both in Rotifera), and *Euplotes patella* (Ciliophora).

When Arbutus Pond is approached from the Raritan Bay beach side, the pond is invisible because of a dense tree shrub buffer zone

shielding it from the vagaries of the sea. Evidently, many of these trees and shrubs were planted in a definite pattern many years ago when the pond and its immediate surroundings were part of a large estate. The first woody plants of any volume encountered via this sea-side approach are arranged in a tall hedge, which appears to consist oftwo species of privet: common privet and California privet. Between this hedge and the pond's edge is a dense thicket of both introduced and native trees, shrubs, and vines. Trees such as American elm, slippery elm, American basswood, eastern catalpa, white mulberry, and Ward's willow make a scattered showing over a dense mixture of plants such as poison ivy, American bittersweet, Virginia creeper, Japanese honeysuckle, and the bristling American barberry.

Commonly, the deciduous woods around Arbutus Pond come to the edge of its waters, and often overhang the pond; but there are a few spots where there occur either marsh herb or shrub clusters. At the north end of the pond, closest to Hylan Boulevard, one open area was seen to have a nice stand of the blue-flowered pickerel weed beside a dense stand of mild water pepper. Some of the birds seen in the pond's immediate vicinity were the brown thrasher, common mockingbird, yellow warbler, American crow, gray catbird, and several female mallard ducks paddling on the pond, each with a half dozen or so ducklings behind them. Hellgrammites, the larvae of dobson flies, were frequently found under logs and rocks, where fishermen seek them when they run out of live bait. The air glittered with green darners, eastern blue darners, common amberwing, black-winged damselfly, violet dancer, civil bluet, and the common skimmer. Swarms of whirligig beetles milled about on the water, and occasionally butterflies such as the little wood satyr coasted by overhead.

A young snapping turtle was caught and found to weigh nineteen ounces, with a length of twelve inches when its head and tail were extended. A number of fish were caught and measured as follows: Two goldfish measured 11 and 12 inches; three carp measured 8, 9, and 10 inches; seven bluegills measured 5 to 6 inches each; three American perch measured 4 to 5 inches each; and, one black bullhead was measured at 11½ inches in length. On several occasions large colonies, 6 to 9 inches across, of *Pectinatella magnifica* (Bryozoa) were retrieved when seen floating in the water.

Small animals and plants were collected at several intervals through the summer of 1975. During the last part of June it was observed that the previously clear water, except after heavy rains, was becoming somewhat murky and light green in color. Examination of this water under a microscope showed very high quantities of minute filaments of a blue-green alga mixed with threads of a green alga. Thereafter, as the summer passed the water became steadily more turbid until it

actually had the color of green-pea soup. Evidently, what was happening was that as these minute algae continued to burgeon, myriad numbers of macro- and microfauna associated with these algae also multiplied many times. Some of these were found to be: *Bosmina coregoni* and *Ceriodaphnia reticulata* (both are Cladocera); *Diaptomus* sp. and *Cyclops* Sp. (both are Copepoda); and *Paramecia* sp. and *Leucophrys* (both are Ciliophora). Plankton samples were found to include among small animals: *Daphnia pulex, Amoeba proteus,* many *Difflugia urceolata, Difflugia pyriformis, Difflugia corona, Astraamoeba radiosa, Paramecium aurelia, Vorticella campanula, Phacus* sp., *Actinophrys* sp., and *Colpoda* sp. Small plants noted were: *Scenedesmus quadricauda*, and species of *Ulothrix, Spyrogyra, Pinnularia, Cyclotella, Navicula, Gomphonema, Amphora*, and *Tabellaria.* The Euglenoids, *Buglena viridis* and *E.gracilis* were also identified in this plankton.

What the relationship of this rich plankton was with small herbivores and carnivores was not really clear except that there was an increase of a mottled, brown planarian, and several snails such as Winkles, *Physa gyrina*, and *Helisoma anceps.* Also, not noticed earlier, were occasional large floating masses of the small species of duckweeds.

Vascular Plants

Osmundaceae.
    Osmunda cinnamonea L.   Cinnamon Fern
Polypodiaceae.
    Onoclea sensibilis L.   Sensitive Fern
Cyperaceae.
    Carex stricta Lam.   Tussock Sedge
Araceae.
    Peltandra virginica (L.) Kunth.   Arrow Arum
Lemnaceae.
    Lemnia minor L.   Small Duckweed
    Spirodela polyrhiza (L.) Schleid.   Big Duckweed
Pontederiaceae.
    Pontederia cordata L.   Pickerel Weed
Liliaceae.
    Smilacena racemosa (L.) Desf.   False Solomon's-seal
    Smilax rotundifolia   Common Catbrier
Salicaceae.
    Salix caroliniana Michx.   Ward's Willow
Corylaceae.
    Betula papyrifera Marsh.   Paper Birch
Fagaceae.
    Quercus palustris Muenschh.   Pin Oak
    Quercus rubra L.   Red oak

Ulmaceae.
Ulmus americana L. American Elm
Ulmus rubra Muhl. Slippery Elm
Moraceae.
Morus alba L. White Mulberry
Polygonaceae.
Polygonum hydropiperoides Michx. Mild Water Pepper
Berberidaceae.
Berberis canadensis Mill. American Barberry
Lauraceae.
Lindera benzoin (L.) Blume Spice Bush
Sassafras albidum (Nutt.) Nees. Sassafras
Hamamelidaceae.
Liquidambar styricaflua L. Sweet Gum
Rosaceae.
Prunus virginiana (l.) Chokecherry
Rosa palustris Marsh. Swamp Rose
Spiraea tomentosa L. Hardhack
Anacardiaceae.
Rhus radicans L. Poison Ivy
Celastraceae.
Celastrus scandens L. American Bittersweet
Aceraceae.
Acer platanoides L. Norway Maple
Acer rubrum L. Red Maple
Vitaceae.
Parthenocissus quinquefolia (L.) Planch. Virginia Creeper
Tiliaceae.
Tilia americana L. American Basswood
Malvaceae.
Hibiscus palustris L. Rose Mallow
Hypericaceae.
Hypericum virginicum L. St. John's-wort
Onagraceae.
Ludwigia palustris (L.) Ell. False Loosestrife
Cornaceae.
Cornus amomum Mill. Silky Dogwood
Nyssa sylvatica Marsh. Sourgum
Ericaceae.
Vaccineum corymbosom L. High Bush Blueberry
Loganiaceae.
Ligustrum ovalifolium Hassk. California Privet
Ligustrum vulgare L. Common Privet
Asclepiadaceae.
Asclepias incarnata L. Swamp Milkweed
Bignoniaceae.
Catalpa bignonioides Walt. Eastern Catalpa
Rubiaceae.
Cephalanthus occidentalis L. Buttonbush
Caprifoliaceae.
Lonicera japonica Thumb. Japanese Honeysuckle
Viburnum acerifolium L. Maple-leaf Viburnum
Viburnum dentatum L. Arrowwood

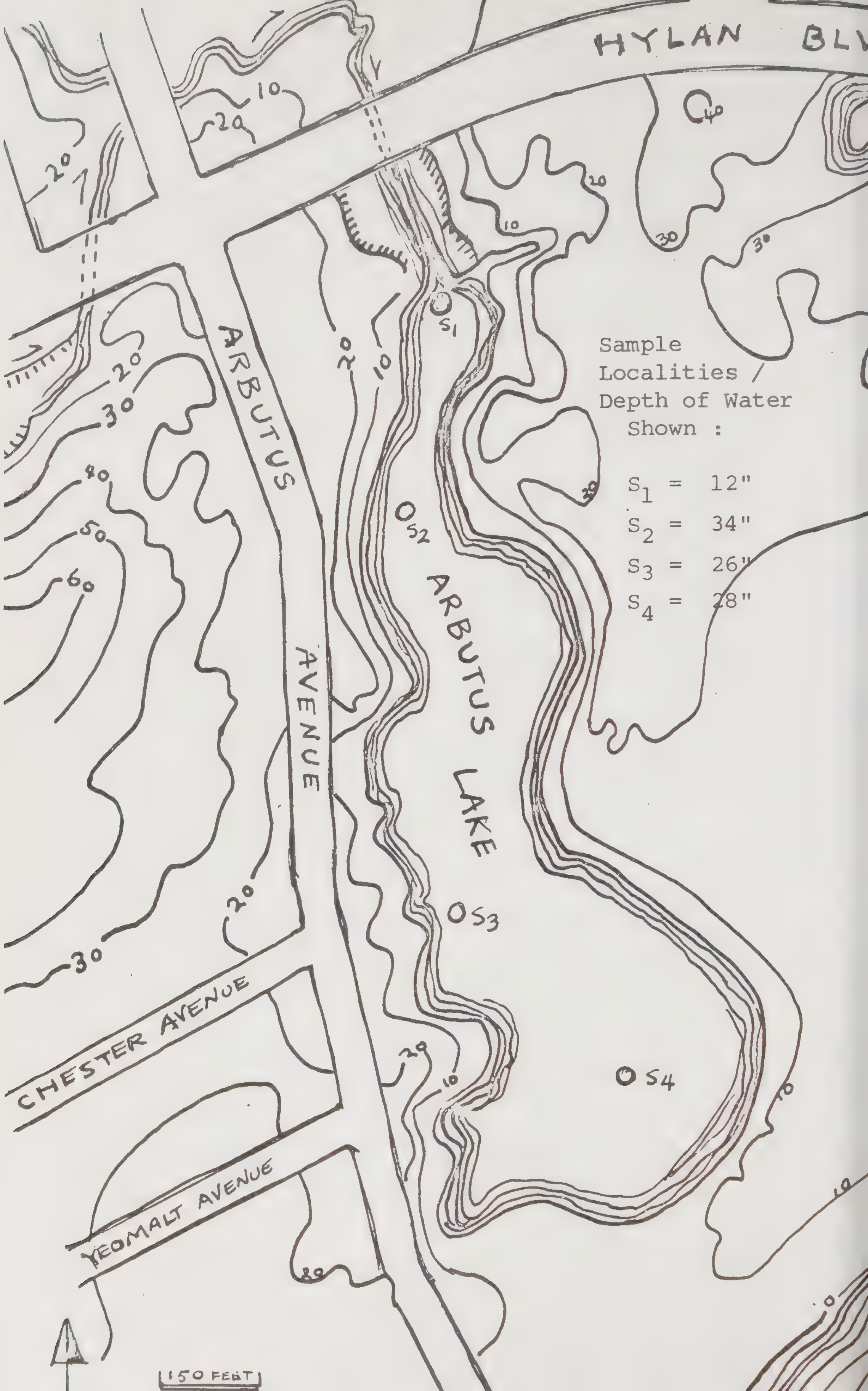
Fauna:

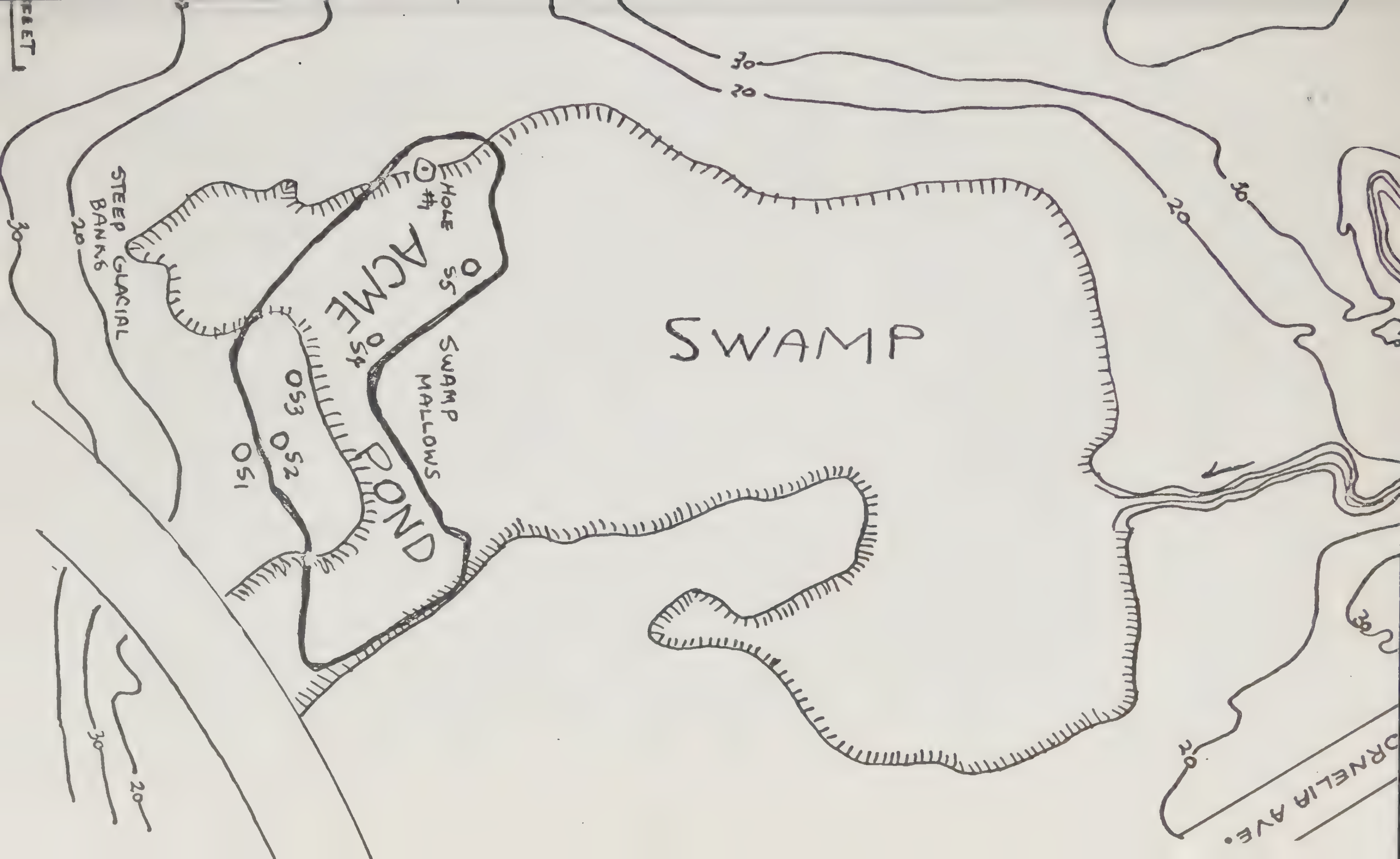
Aves.
Toxostoma rufum. Brown Thrasher
Mimus polyglottos. Mockingbird
Dendroica petechnia. Yellow Warbler
Corvus brachyrhynchos. American Crow
Dumetella carolinensis. Gray Catbirn
Anas platyrhynchos. Mallard

Reptilia.
Chelydra serpentina. Snapping Turtle
Chrysemys picta. Painted Turtle

Pisces.
Eupomotus cyanellus. Green Sunfish
Lepomis macrochirus. Bluegill
Ictalurus melas. Black Bullhead
Carassius auratus. Goldfish
Cyprinus carpio. Carp
Perca flavescens. American Perch

Insects.
Coleoptera. *Dineutes americanus.* Whirligig Beetle
Odonata. *Aeshnidae.* Dragonflies
Odonata. *Calopterygidae.* Damselflies
Hemiptera. Gerridae. *Gerris marginatus.* Water Strider
Hemiptera. Corexidae. *Arctocorixa interrupta.* Water Boatman
Corydalidae. *Corydalus cornutus.* Hellgrammites (Dobson fly larva)
Aeshnidae. *Anax junius.* Green Darner
Aeshna verticalis. Eastern Blue Darner
Perithemis tnera. Common Amberwing
Calopteryx maculata. Black-winged Damselfly
Argia violacea. Violet Dancer
Enallagma civile. Civil Bluet
Libellula luctuosa. Common Skimmer
Euptychia cymela. Little Wood Satyr


HYLAN BLV
ARBUTUS AVENUE
ARBUTUS LAKE
CHESTER AVENUE
YEOMALT AVENUE
150 FEET
Sample Localities / Depth of Water Shown :
S1 = 12"
S2 = 34"
S3 = 26"
S4 = 28"
S1
S2
S3
S4


SWAMP
HOLE #1
S5
SWAMP MALLOWS
ACME POND
S4
S3
S2
S1
STEEP GLACIAL BANKS
ORNELIA AVE.
30
20
EET

Acme Pond and Arbutus Lake
by Hans Behm, M.S.

ACME POND

Acme Pond is located north of Wolfe's Pond, between Holton and Cornelia Avenues, or 730 feet west of the intersection of Cornelia Avenue and Hylan Boulevard, and 1300 feet northeast of the intersection of Hylan Boulevard and Holton Avenue. This pond is not delineated on the 1896 Historical Geology map, nor is it shown on the 1913 topographic map. The rock line map series prepared by the WPA in 1937 do not show the pond either. Acme Pond is located in the southern portion of a large marsh extending from Hylan Boulevard to more than a thousand feet northward. A fresh-water creek enters the northern part.

The pond is 600 feet long if measured across and averages 200 feet in width and two to three feet deep. It is roughly shaped like an "L". The surface area is 97,707 square feet, or 2.24 acres. The pond's elevation is 15 feet above sea level. The temperature of the water was 74°F in the center near the surface and 73°F near shore on May 22, 1975. The inherent color was greenish brown, though on a number of occasions during the summer and fall of 1975, it appeared quite muddy, because of excess rain, erosion and the transportation and suspension of clay-sized particles. The outflow is located at the eastern end of the pond, which continues beneath Hylan Boulevard and connects with Wolfe's Pond. The pond probably was created by the partial cutoff of its outflow when the boulevard was built.

Geologic Setting. The pond's periphery is surrounded by glacial till of the terminal moraine. The slope is extremely variable and it falls off rather steeply south of the pond and north of Hylan Boulevard. As a result, numerous gullies have been formed by aqueous erosion during periods of high rainfall and causing the fine clay particles washed into the pond to remain in suspension and making the pond's waters very turbid. No meaningful secchi disk readings were possible. The ground northwest of the pond is rather flat and marsh-like, including dense stands of swamp mallows. The deposits of glacial till consist of particles of all sizes, from clay to boulder, with a wide spectrum of composition, and which range in shape from angular, subangular to subrounded and showing all stages of decomposition. A few particles are rounded, a few are equidimensional, or elongate. The till is distinctly reddish-brown due to the incorporation of the red shales

and sandstones of the Newark Group. The sediments also include many gneisses and granites, some basalt, quartzite, conglomerate, and multicolored shales and sandstones.

The stratigraphic sequence beneath the pond is as follows: typical glacial Wisconsin till of the terminal moraine; peat-like deposits in places and organic muds elsewhere; black humus-like deposits and a thick leaf mat with much humus.

Microscopic Description of Sediments. Angular and subangular, clear and transparent quartz is abundant. White, milky, angular to subangular and some subrounded grains of quartz are also present. In addition, the processed samples show reddish and pinkish grains of quartz, largely subangular and subrounded. Moreover, subangular and subrounded grains of the red shales and sandstones of the Newark Group are also included. I also found fragments of arkose, gneiss and granite, white and pinkish feldspar, some actinolite and chlorite, some white and brown mica, a few grains of magnetite and a little amphibole.

Microscopic Description of Faunal and Floral Constituents. A high percentage of plant debris is associated with the benthos. One sample I collected resembled a peat-like material, which apparently forms a thick mat along the bottom of the northwest section of the pond and which probably represents the former swamp deposits, before the pond was created. The plant portion includes many seeds, charred plant debris and partially carbonized material. the Testacida are represented by *Difflugia oblonga* Ehrenberg and *Arcella vulgaris* Ehrenberg. The ostracoda included *Cypridopsis vidua* (O.F. Muller), a common fresh-water organism. A high percentage of statoblasts are associated with the bottom muds and belong to the bryozoan *Pectinatella magnifica* Leidy. Living colonies of this organism are attached to partially submerged trunks and tree branches. Gastropods and a good number of small diatoms are also present. The periphyton revealed large quantities of fresh-water shrimps, planarias and the living zooids of *Pectinatella magnifica* Leidy. The color bands of *Cypridopsis vidua* (O.F. Muller) are quite variable. In some the color bands resembled blotches; they may be either green or brown and they are absent in some specimens.

Comments on the Weather. May 22, 1975. was a warm Spring day, with the temperature ranging from 71°F at 10:30 A.M. to 78°F at 11:30 A.M.; but cooler again at 3:00 P.M., or 75°F. A complete low overcast, mostly *Stratus*, was present, which dissipated as the day progressed.

The afternoon was hazy, with poor visibility and a high relative humidity (70%).

ARBUTUS LAKE

This pond, also known as Latourette Pond, lies west of Arbutus Avenue, east of St. Josephs by the Sea, and south of Hylan Boulevard. The pond is 1750 feet long and 700 feet wide at its broadest part toward the southern terminus. The average depth is 2½ feet, though in a few places it was 3 feet. The total surface area is about 558,800 square feet, or 12.8 acres. Elevation is 2½ to 3 feet above sea level and which varies as a function of rainfall. On June 26 and 27, 1975, the temperature of the water was 76°F, measured at a depth of one foot.

The dredged samples revealed a reddish and grayish, very fine clayey mud, containing a small amount of coarse material. The excessive rainfall and the ensuing erosion of the adjacent glacial till banks caused much of the clay-sized fraction to be transported into the pond and settling atop the recent organic muds. Deeper probing revealed oozy organic muds beneath the recently formed brownish-grayish fine sediments. Such a rate of deposition, if it were to continue over the years, would result in the rapid siltation of the pond and bring about its demise. Two small fresh-water creeks enter Arbutus Lake at its northern terminus.

Early published maps in the late 1800s show that Latourette Pond was club-shaped at its northern terminus, part of which was later cut off by the construction of Hylan Boulevard. A marshy environment once flanked this portion of the pond. A bulkhead built in the early 1900s cut this pond off from the Raritan Bay waters, producing a fresh-water body.

During field operations, I observed large colonies of the bryozoan *Pectinatella magnifica* Leidy, attached on submerged branches and tree trunks along the shore. Some colonies measured a foot or more across.

Geologic Setting. In many ways Arbutus Lake is similar to Wolfe's Pond, that is, superimposed on former salt-marsh deposits. Historically it was an open arm of the sea, resembling a very small estuary.

The terrain flanking this pond is similar to that around Wolfe's Pond. Glacial till of the Harbor Hill terminal moraine delineates this fresh-water body. The steepest slopes are present along its western bank, which average a declivity of 23° to 40° in places. The eastern bank is less steep, with a low reading of 8° to a maximum of 27°. At its southern terminus the ground is generally low and of gentle relief and a little steeper along its southwestern part. Rooted trees in the

embankments cause the terrain to be very irregular but very steep in places where the roots hold the soil together.

The above normal precipitation in 1975 produced spectacular erosion gullies along the glacial banks of the pond. A high percentage of the fines were transported into Latourette Pond and deposited along its bottom, causing it to become more shallow.

The stratigraphic sequence beneath the pond is as follows: Upper Cretaceous sands and clays; Pleistocene glacial till; recent salt marsh deposits; recent very fine organic muds; and, recent brownish red clays.

Description of Sediments. The constituents of the glacial till range in size from clay to boulder (1/256 to 256 mm and more). All compositions, densities, degrees of roundness and angularity are present. Prominent in the till are rock fragments and reddish clays derived from the shales and sandstones of the Upper Triassic Newark Series. A great variety of multi-colored quartz pebbles are present. Associated with these sediments are many varieties of gneiss and of granite, including many quartzites, conglomerates and dark igneous rocks.

Microscopic Description of Sediments. The washed samples contain a high percentage of angular and subangular, clear and transparent quartz, much angular and subangular white and milky quartz, angular to subangular pinkish and reddish quartz, and some rusty-colored quartz. The residues also contain a variety of fragmented gneiss and granite; subangular and subrounded elongate fragments of the red shales of the Upper Triassic Newark Group; and, white feldspar, white and green mica, hornblende, a few grains of glauconite and some fly ash.

Microscopic Description of Faunal and Floral Constituents. The statoblasts of the bryozoan *Pectinatella magnifica* Leidy are very common in the bottom sediments. The most common ostracode is *Cypridopsis vidua* (O.F. Muller). The testacida include *Difflugia oblonga* Ehrenberg, *Difflugia corona* Wallich and *Arcella vulgaris* Ehrenberg. Also, the sediments contain fish scales, gastropod shells and a great abundance of very small fresh-water diatoms that are associated with the recent black organic muds. Many seeds and chitinous insect parts are also present.

Comments on the Weather. June 26, 1975 was a cloudy day with *Altocumulus, Stratocumulus* and *Cirrostratus* constituting the cloud layer. Visibility was good and the air was calm.

A C M E   P O N D

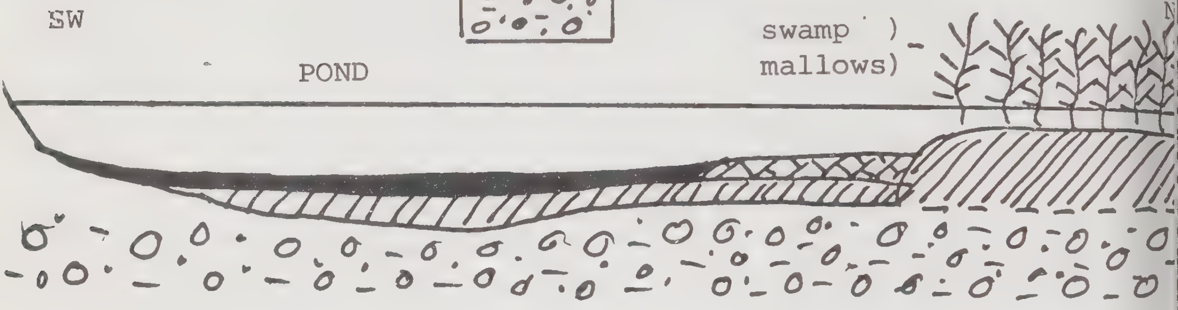
Generalized Cross-section

Recent black organic muds

Recent swamp deposits

Recent turf-like deposits along northeastern & northern bottoms

Pleistocene glacial till



A R B U T U S   L A K E   (Latourette Pond)

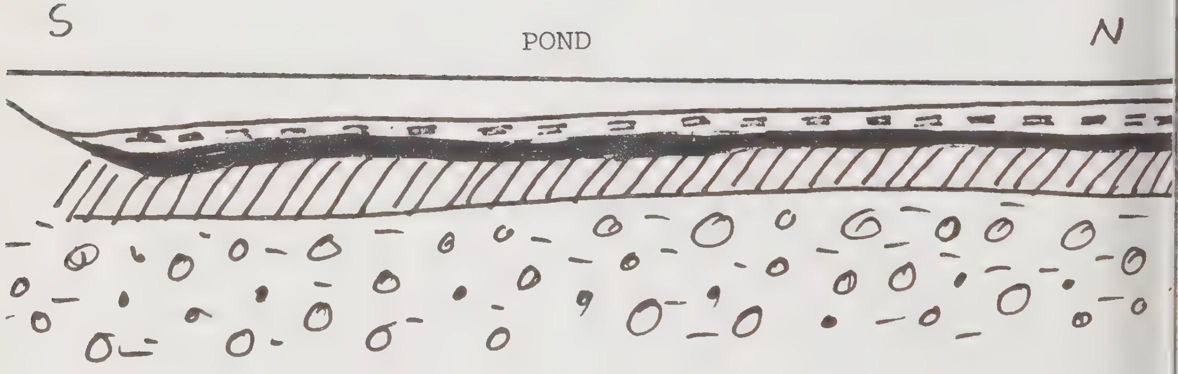
Generalized Cross-section

Recent muddy clay, brownish red

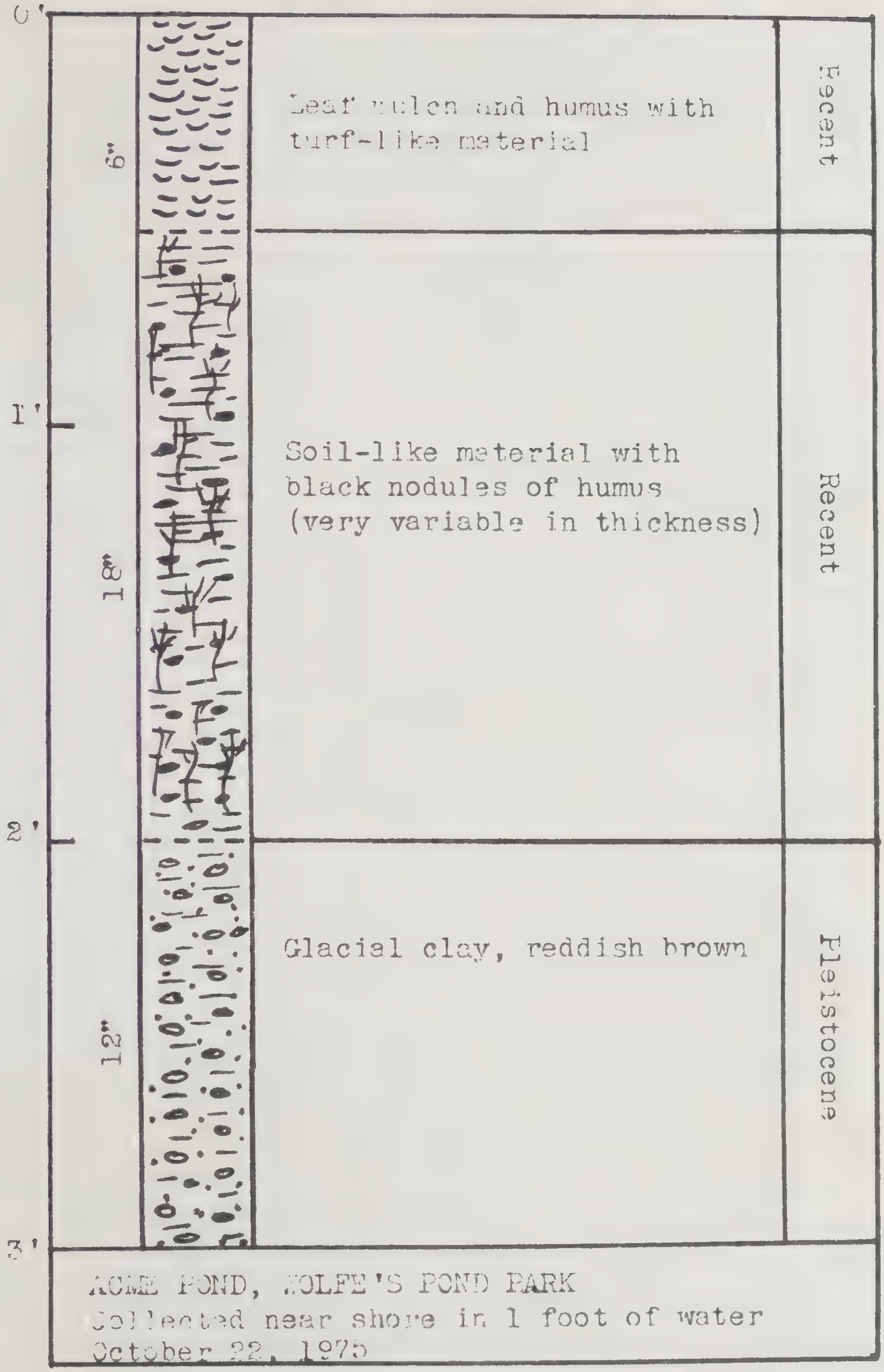
Recent, very fine organic muds

Recent salt marsh deposits

Pleistocene glacial Till



Auger Sample # 1



ANNUAL BIRD COUNTS, 1976-1978

by Mathilde P. Weingartner

ANNUAL CHRISTMAS BIRD COUNT 1976

December 18, 1976 was the earliest date on which we have ever conducted an annual count. However, the weather had been very cold and windy for several weeks. All the fresh-water ponds were frozen; only a few had any open water, forcing most of the fresh-water ducks further South. A strong northwest wind, with gusts up to 40 MPH, kept the tide at low ebb most of the day, exposing large mud flats. This favored shore birds, but most diving ducks were too far out, making them difficult to see, even with a telescope. The high winds kept land birds down near the ground and equally hard to see.

In all the years since the count was first taken on the island in 1908, the phoebe has been seen only three times; pipits, four times; and the Virginia rail, only once. These are not rare birds, but at this time of the year they usually do not occur this far north.

Observers: Doris Barlow, Mary and Philip Benjaminson, Richard Buegler, Stanley Caufield, Robert Clermont, Karl Cerasoli, Gloria Deppe, Charles and Jeffrey Fallon, Howard Fischer, Lucy James, Tom Materfis, Anna Meyer, Charles Pearson, Celia Polomany, Norma and William Siebenheller, Bruce Weber, Mathilde Weingartner, Clayton Wollney, and Richard Zain-Eldeen.

The 69,741 individuals of 85 species of birds are:

horned grebe, 28
great cormorant, 1
double-crested cormorant, 3
great blue heron, 4
black-crowned night heron, 4
Canada goose, 4
brant, 649
mallards, 664
black duck, 575
gadwall, 6
pintail, 11
green-winged teal, 9
baldpate, 245
canvasback, 334
greater scaup, 2,714
goldeneye, 188
bufflehead, 243
oldsquaw, 45
white-winged scoter, 7
surf scoter, 7
ruddy duck, 2
common merganser, 6
red-breasted merganser, 36
sharp-shinned hawk, 1
red-tailed hawk, 7
rough-legged hawk, 8
marsh hawk, 5
kestrel, 10
pheasant, 28
Virginia rail, 1
coot, 3
killdeer, 25
ruddy turnstone, 33
Wilson's snipe, 14
purple sandpiper, 47
dunlin, 36
sanderling, 23
great black-backed gull, 3,637
herring gull, 50,000
ring-billed gull, 145
laughing gull, 13
Bonaparte's gull, 294
mourning dove, 414
barn owl, 2
kingfisher, 2
flicker, 3

downy woodpecker, 18
phoebe, 1
horned lark, 52
blue jay, 75
crow, 438
fish crow, 3
black-capped chickadee, 25
tufted titmouse, 9
white-breasted nuthatch, 2
red-breasted nuthatch, 3
Carolina wren, 4
mockingbird, 56
robin, 69
brown thrasher, 1
hermit thrush, 7
water pipit, 12
starling, 7,568
myrtle warbler, 68
English sparrow, 321
meadowlark, 3
redwing blackbird, 130
rusty blackbird, 1
grackle, 1
cowbird, 28
cardinal, 82
purple finch, 17
house finch, 54
goldfinch, 55
rufous-sided towhee, 1
Savannah sparrow, 1
slate-colored junco, 60
tree sparrow, 15
field sparrow, 10
white-crowned sparrow, 2
white-throated sparrow, 159
fox sparrow, 7
swamp sparrow, 4
song sparrow, 77
snow bunting, 47

WATERBIRD COUNT 1977

After weeks of below-normal temperatures and immediately preceded by a seven-inch snowfall, the eight observers who tried to drive or walk near any of the shores of Staten Island on Sunday, January 16, found it very difficult. In those places where there were icy crusts on the snow, or deep wind-plowed furrows of ice and snow, it was hard enough to stand up, let alone walk. By 10:30 a.m., snow was falling again, but we were grateful that it was not as cold as it had been and that the wind had dropped. All lakes, ponds, and most salt creeks were solidly frozen. Along the Arthur Kill and the Kill van Kull there was icy slush near the shore. The Great Kills Yacht Basin was completely covered with ice. Therefore, most of the waterbirds were in the bay or the deeper parts of creeks. Even the fresh-water ducks had to resort to salt water.

The hooded merganser was spotted in Fresh Kills Creek by Charles and Tom Materfis. Mathilde Weingartner noted a clapper rail on the shore of the Arthur Kill at the foot of Victory Boulevard. This bird is not part of the count, but it is an interesting observation.

Observers: Charles Fallon, Henry Flamm, Tom Materfis, Norma and William Siebenheller, John Stonick, Mathilde Weingartner, and Richard Zain-Eldeen.

The 3,136 individuals of 17 species are:

horned grebe, 2
double-crested cormorant, 1
Canada geese, 3
brant, 156
mallard, 196
black duck, 818
pintail, 2
green-winged teal, 20
American widgeon, 2
canvasback, 153
greater scaup, 1,571
goldeneye, 50
bufflehead, 150
oldsquaw, 8
white-winged scoter, 1
hooded merganser, 1
red-breasted merganser, 2

ANNUAL CHRISTMAS BIRD COUNT 1977

December 18, 1977, the day of the count was characterized by very miserable weather: light rain overnight combined with below-freezing temperatures to make roads treacherous. The rain became continuous during the day and a northeast wind of 15 mph added to the discomfort and impaired visibility which already was poor because of the very dark sky.

However, the group of birders were able to spot and record 84 species and 68,138 individuals. Unusual species seen were: the brown creeper which is not a common winter resident; a sharp-shinned hawk, seen only once before in the 69 years of the count on Staten Island; glaucous and Iceland gulls; a red-bellied woodpecker which is a southern bird and rarely seen here; a brown thrasher, and the common redpoll, which is not too common this far south.

There were a large number of purple sandpipers seen in Great Kills Park and 11 short-eared owls were flushed at the Fresh Kills Landfill. These birds formerly wintered at Great Kills where they fed mostly on rats and mice, but since the area has been cleaned up as Gateway Park, the birds have moved to the landfill.

Observers: Doris Barlow, Mary and Philip Benjaminson, Richard Buegler, Stanley Caufield, Karl Cerasoli, Robert Clermont, Charles and Jeffrey Fallon, Henry Flamm, Howard Fischer, Harry Jenkins, Michael and Laura Kelly, Kenneth Lewis, Tom Materfis, Anna Meyer, Bernard Paul, Sr. & Jr., Charles Pearson, Celia Polomany, George Pratt, Allan Rennie, Brian Ruffe, Norma and William Siebenheller, Edna Schmidt, John Stonick, Richard Zain-Eldeen, Mathilde Weingartner, compiler.

common loon, 1
horned grebe, 23
pied-billed grebe, 1
double-crested cormorant, 1
great blue heron, 1
black-crowned night heron, 1
Canada goose, 76
brant, 81
mallard, 233
black duck, 366
green-winged teal, 2
American widgeon, 7
ring-necked duck, 3
canvasback, 1
greater scaup, 691
common goldeneye, 408
bufflehead, 303
oldsquaw, 59
common merganser, 2
red-breasted merganser, 2
sharp-shinned hawk, 1
red-tailed hawk, 1
rough-legged hawk, 12
red-shouldered hawk, 1
marsh hawk, 14
American kestrel, 7
ring-necked pheasant, 45
killdeer, 4
ruddy turnstone, 44
American woodcock, 2
common snipe, 3
purple sandpiper, 191
dunlin, 32
sanderlin, 95
glaucous gull, 1
Iceland gull, 1
great black-backed gull, 4,145
herring gull, 50,000+
ring-billed gull, 478
Bonaparte's gull, 1, 968
mourning dove, 173
barn owl, 1
screech owl, 1
short-eared owl, 11

belted kingfisher, 2
common flicker, 5
red-bellied woodpecker, 1
hairy woodpecker, 4
downy woodpecker, 21
horned lark, 23
blue jay, 104
common crow, 393
black-capped chickadee, 118
tufted titmouse, 15
white-breasted nuthatch, 34
red-breasted nuthatch, 4
brown creeper, 1
Carolina wren, 1
mockingbird, 52
brown thrasher, 1
robin, 20
water pipit, 1
starling, 5,801
yellow-rumped warbler, 25
house sparrow, 337
red-winged blackbird, 307
rusty blackbird, 1
common grackle, 3
brown-headed cowbird, 38
cardinal, 101
house finch, 86
common redpoll, 2
pine siskin, 70
goldfinch, 96
rufous-sided towhee, 1
Savannah sparrow, 3
dark-eyed junco, 278
tree sparrow, 111
field sparrow, 2
white-crowned sparrow, 3
white-throated sparrow, 495
swamp sparrow, 3
song sparrow, 75
snow bunting, 7

WATERBIRD COUNT 1978

January 15, 1978 was a very cold and blustery day, the constant below-freezing temperatures making it difficult for observers as well as birds who found that most of the fresh water was frozen. Some of the salt-water species were not found, such as loons, grebes, and cormorants. The frozen ponds forced many ducks to the brackish water creeks.

Observers: Stanley Caufield, Robert Clermont, Howard Fischer, Charles Fallon, Tom Materfis, the Bernard Pauls, Sr. & Jr., Allan Rennie, Norma and William Siebenheller, and Richard Zain-Eldeen.

The 1,875 individuals of 12 species are:

Canada geese, 6
brant, 57
mallard, 260
black ducks, 307
gadwall, 2
green-winged teal, 90
canvasback, 200
greater scaup, 563
common goldeneye, 123
bufflehead, 252
oldsquaw, 13
red-breasted merganser, 2

BOOK REVIEW

Environmental Assessments and Statements by John E. Heer, Jr., and D. Joseph Hagerty. Van Nostrand-Reinhold. 1977. $17.95

Environmental impact statements have been required under the various legislations which have been passed since the National Environmental Protection Act was adopted in 1970. Over twenty states have provided for such legislation including New York State, which recently approved the State Environmental Quality Review Act known as SEQRA.

These statements, which are in-depth and educated assessments of the natural, historical, and cultural resources of an area, provide an answer to the thousands of questions which may be raised about the proposed development of any area. A variety of specialists and scientists as well as knowledgeable members of the public should work together in order to ascertain what effect the proposed development will have on the environment and whether it should be allowed to proceed. If not, whether any changes are proposed in the planning which may allow the work to go forward.

The impact statement is prepared by many who may have basic scientific and cultural knowledge of an area and in turn is evaluated by members of the community in a public hearing.

This book provides a brief history leading to the requirements for environmental impact statements and outlines the legal requirements and the administration of public hearings. Separate chapters on the different kinds of statements which are needed and offering sample statements are included as well as texts of the supporting laws. The authors recognize the importance of public participation and warn that if this is not included early in the process and maintained throughout, the entire procedure may be forfeited.

This is a useful handbook for environmental organizations, consultants, and for those working in fields in which environmental impact statements are required, as well as for concerned members of the communities involved.

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The Excavation of a 20th Century Site
by Sherene Baugher-Perlin, Ph.D.

In North America, most archaeological work done by anthropologists has dealt either with prehistoric or protohistoric sites. Historic sites have traditionally been excavated by historical societies, often with local amateurs running the excavation.[1] It is only within the last ten or so years that some anthropoligists, e.g., Deetz, Fontana, Schuyler, and Stone, have turned their attention to historic sites. The techniques and theoretical perspectives of anthropological archaeology can expand the dimensions of historical archaeology. Anthropological archaeology can provide data on house structures, household belongings, and on life style in general, beyond what is known from the historical documents, as well as providing proof. One must remember that documentary evidence "tells us what was available to the early settlers, not what was actually used" (Deetz, 1968:122). In order for historical archaeology to reach its full potential, we need to combine both historical and archaeological data.

To demonstrate this need, I supervised students who excavated an early 20th century foundation. In order fully to understand the function of the building once resting on this foundation and the reasons and/or manner of its destruction, more than documentary materials were needed. In addition to digging out and analyzing the materials found there, I also interviewed former residents of the site (ethnoarchaeology). By combining archaeological, historical and ethnoarchaeological data, I was able to obtain a more complete picture of the building and finally, to identify it. As a result, the students participating received a graphic illustration of the contribution to knowledge by the combination of these techniques.

The Excavation

From 1972 to 1977, Wagner College students, under my direction, participated in an archaeological field program on Staten Island. They excavated a site known as the Prall Site.[2] That site is located in the

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[1]This point is not meant to belittle amateur archaeologists. I have met some very conscientious and competent amateur archaeologists who worked under the direction and guidance of Robert Funk, State Archaeologist of New York. However, I have also seen the destruction of sites caused by the careless and incompetent work of other amateurs.

[2]The Prall Site is named after the first European owner of the property, Arent Prall.

village of Richmondtown (Staten Island, N.Y.), on land that is owned jointly by the Staten Island Historical Society and the New York City Department of Parks (see Fig. 1). The excavation of this foundation and its eventual identification was only part of the excavation of the Prall Site.[3]

In 1973, the students noticed a small six-inch section of a cement building foundation through the grass. A 5-foot x 5-foot square was established inside this portion of the foundation and parts of a Model T Ford were unearthed. Prompted by these finds, historical research was carried out before continuing with the dig.

All public documents, such as deeds, wills, mortgages, insurance maps, topographical and survey maps that pertained to this property were examined. *Bromley's Atlas of the Borough of Richmond, 1917* is the only published record that mentions the structure (see Fig. 2). It is listed in the atlas as a frame shed, 16 feet wide and 34 feet long. No other information is given. (It should be noted here that as a general term "shed" was used in these atlases to identify a variety of structures including small barns, garages, and storage buildings; so the exact function of the building is unknown.) Furthermore, the building did not appear on *Robinson's Atlas of the Borough of Richmond, 1907*, the *Borough of Richmond Topographical Survey, 1911*, or the *Insurance Maps of the Borough of Richmond, 1937*, even though these maps listed sheds. Therefore, from the historical data, the structure appears to have been built sometime between 1912 and 1917 and may have been destroyed sometime between 1918 and 1936. Since there was no information pertaining to the erection, use, or destruction of this building these data had to be obtained archaeologically.

Most of the excavation of the site and the laboratory analysis of the artifacts took place during the fall of 1976 and the spring of 1977. In Fall 1976, the original 5-foot x 5-foot square was reopened (it had been covered with boards), and enlarged to a 12-foot x 12-foot square. In addition, an 8-foot x 8-foot square was established inside the foundation (see Fig. 3). Along with the squares, three trenches were dug along the east, west, and south walls (the north wall was underneath a rock pile left by the Richmondtown Restoration Center in 1970). The building was excavated by means of trowelling. The back dirt was put through a quarter-inch screen, although it was unusual to find any artifacts in the screen. All important finds were mapped according to their horizontal and vertical positions and were photographed *in situ*. The excavation was accomplished, using natural levels as shown in Fig. 4. Two Model T Ford frames were

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[3]For details of the complete excavation of The Prall Site see: The Prall Site: A Case Study in Historical Archaeology. Baugher-Perlin, 1978.

Fig. 1. A map showing the position of the Prall Site, Block 4443, Lots 11 and 15 (based on plate 17 of *Maps of the Borough of Richmond*, Jan. 1925, updated for 1955, vol. 2, Blocks 4302-4443). This map also shows Richmondtown land owned by New York City Department of Parks.

found between two and four feet below ground surface. Both frames were sitting on broken slabs of concrete flooring and they were both covered with broken segments of the building's walls.

The excavation revealed that this structure was 16 feet wide and approximately 25 feet long. The walls, which were made of cement, were eight inches thick and the foundation footing was four feet below the present ground level. From the lines on the walls, it appears that the cement was poured in small sections (eight feet long and two feet

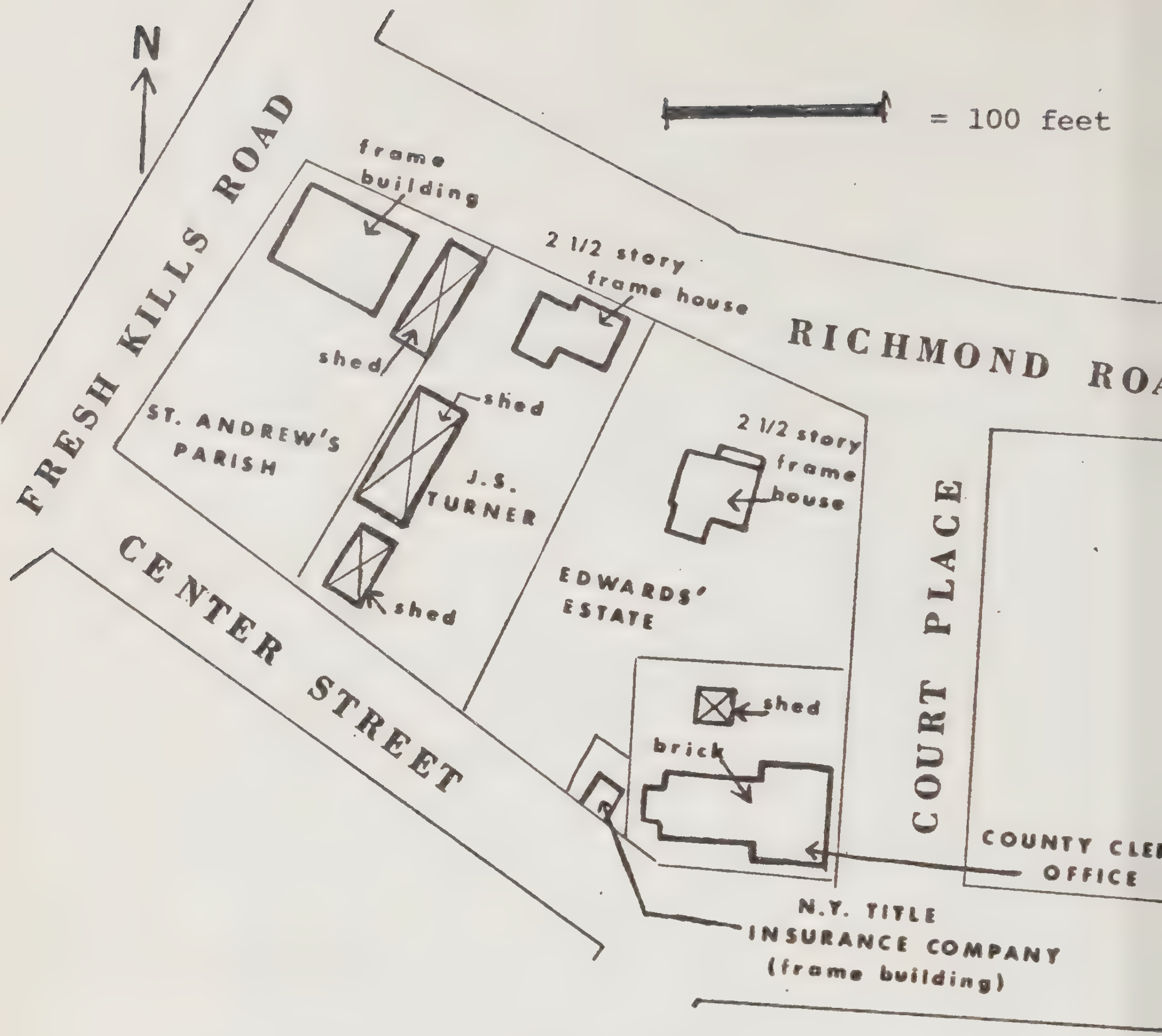

Fig. 2. A map showing the building on lots 11 and 15 in 1917 (based on George W. Bromley's *Atlas of the City of New York, Borough of Richmond*, vol. 2, Wards 4 & 5, plate 17, 1917).

deep), at different time intervals (Jack Costantino, President of Costantino Construction Company: personal communication). The cement in walls B, C, and D (see Fig. 3), contained more sand than did the cement in walls A and E; this information indicated that this structure was built in two separate phases (ibid: personal communication).

The artifact assemblage retrieved from the site contained ceramics, glass, metal, plastic, leather, bone, and shell. Among the metal artifacts, a large amount of automobile parts were uncovered, including the drive shaft of a Model T Ford coupe and the drive shaft and chassis of a Model T Ford truck. Most of the artifacts which could be dated bear a late 19th or early 20th century date.

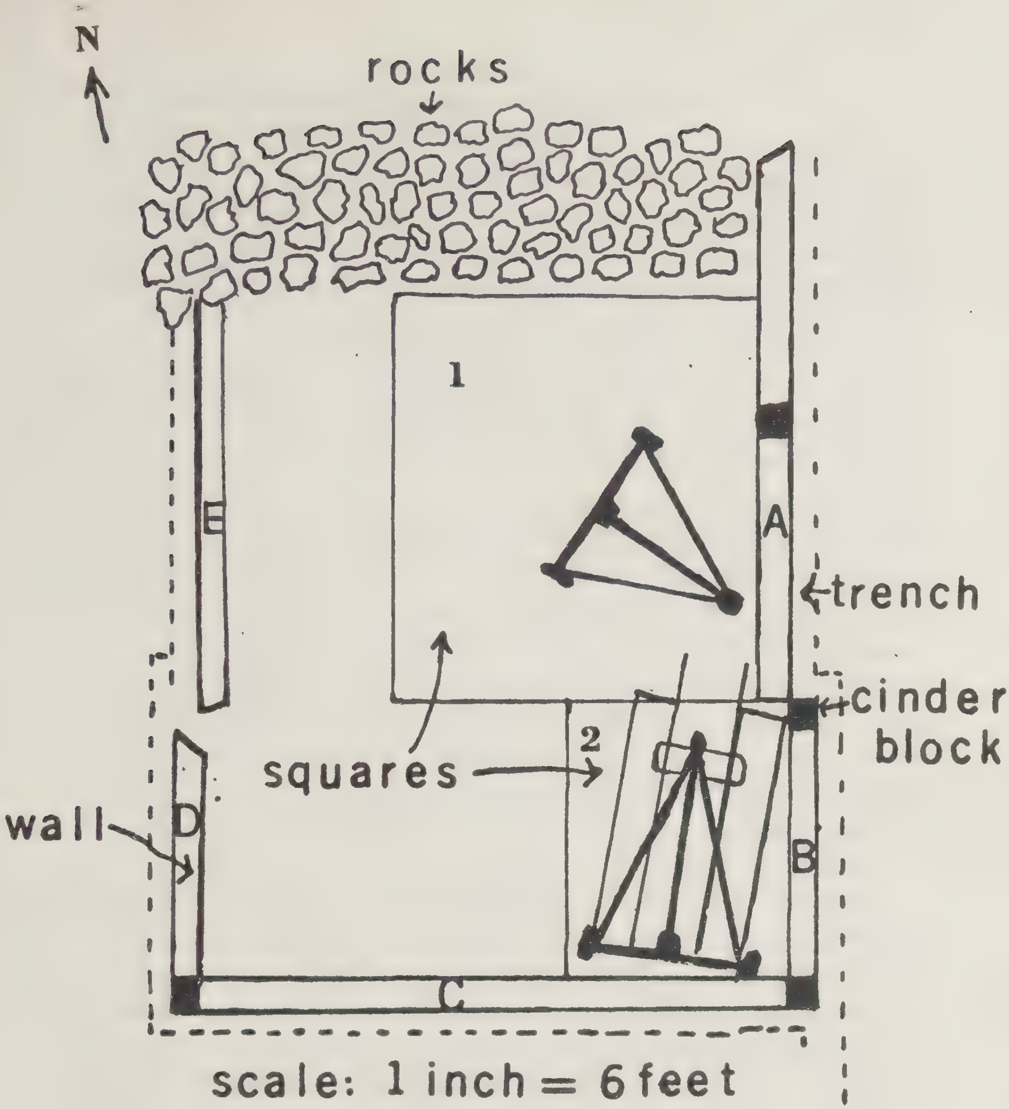

Fig. 3. A map of the garage, showing the squares and trenches. The location of the Model T Ford drive shafts is shown.

Within the building, 307 ceramic artifacts were uncovered. They were: 196 earthenware specimens; 44 stoneware fragments and 67 porcelain sherds. For the most part, the artifacts came from storage containers, dinnerware, and wash sets. However, most of the specimens were too small to determine their exact function, e.g., a dish, a saucer, or a dessert plate. These artifacts are all items that one would find in a kitchen or dining area. None of the ceramic artifacts was of fine quality but the collection exhibited a diversity in both quality and types.

A total of 3,030 glass artifacts were unearthed in the garage. They were 12 whole bottles; 75 bottle specimens; 1,705 fragments of window glass and 1,238 miscellaneous glass objects. Except for a headlight bulb and a taillight lens, all the bottle and miscellaneous glass artifacts are items that one would expect to find in a household. Because a good number of the bottles had narrow necks and mouths, I do not believe they were used as storage jars for nuts and bolts in the garage. These items are probably only refuse from a 20th century household. It seemed that the glass artifacts were all American-made.

If one weighed all the artifacts, including the drive shaft and chassis of a Model T Ford truck and the drive shaft of a Model T Ford, then the metallic specimens would make up the bulk of the collection. Both the truck and car were probably manufactured about 1915. In addition, 1,002 metal artifacts were found of which 433 (43.21%) were datable. The 290 nails and the 121 automobile parts, which together comprise 40.75% of the metallic assemblage, bear a post-1900 date. The other datable items were manufactured, for the most part, in the late 19th century. Most of the miscellaneous specimens, e.g., nuts, bolts, screws and washers (except for their corroded condition), looked like their contemporary counterparts found in hardware stores. This made them easy to identify but impossible to date them accurately.

The nails, spikes, water and gas pipes and construction hardware are items that come from the building itself. The various automobile parts are objects that one would expect to find in a garage. The buckets, spoons, and tin cans are articles that would be found in a kitchen but could also have been used in a garage. The tools and miscellaneous metal objects are items that one could find in either a house or a garage. The metallic assemblage is probably refuse from both a house and a garage.

If the metallic assemblage all comes from one household—the Model T Ford truck and coupe, a telephone, and a carriage—it can be assumed that the owner could afford to purchase more than just the necessities of life. While these items reflect some degree of affluence for the early 20th century, they by themselves do not indicate in what income range the family which generated this refuse lived.

There were a few artifacts that did not fit into the general categories of ceramics, glass and metal. These specimens included: plastic, rubber, roof shingling, tar paper, linoleum, painted wood, buttons, doll parts, tobacco pipes, animal bones (beef and chicken), and shell. This miscellaneous assemblage is probably refuse from both a house and a garage.

Archaeological Conclusions

After combining the analyses on the various artifact assemblages and the data on the building, several interpretations emerge. The architectural material, e.g., nails, spikes, hinges, house gutters, etc., probably came from the building itself. The presence of window glass, which comprises the largest number of artifacts (1,705 specimens), suggests that the structure had at least one window. The presence of electrical wiring and water and gas pipes indicates that it may have had electric light, heat, and water. If people worked there throughout the year, then it would not be surprising to have electricity, heat, and water in the building.

Secondly, the building may have been used as a workroom and/or a garage. Out of the total artifact assemblage, 11.02% are items which could be used for repairing cars, e.g., mechanic's tools, automobile parts, and miscellaneous hardware. However, if this structure was used as a professional body shop rather than a private workroom, then there would be a high probability for finding a variety of tools. Only five broken tools were unearthed. In addition, objects, connected with household refuse, were found in the building.

Thirdly, the building may have been used as a storage shed. Kitchen items, e.g. bottles, ceramics and tableware, make up 38.83% of the total assemblage. In addition to the kitchen specimens, toys, shoes, buttons, tobacco pipes and personal items were found in the assemblage. These household objects seem out of place in a garage/workroom, but they are appropriate in a storage shed.

I believed that the function of the building would become clear when one discovered how it was destroyed. One can rule out the possibility that the structure was burned in a fire, because, in that case, many fire-scarred artifacts would be found. However, only 13 glass specimens and one ceramic sherd were fire-crazed. None of the metal showed any evidence of having been in a fire. Only level 3 of the excavation showed a heavy ash concentration, but none of the artifacts in this layer were fire-scarred. Some ash was found in all four levels (see Fig. 4), but there was not enough ash to indicate a fire.

It was my opinion that the building had been purposefully destroyed, but not by fire. Many of the objects found during excavation were items that were broken and/or not reusable, e.g., bottle glass, ceramics, nails, window glass. Because of the number and condition of these artifacts, it seemed that they were purposefully rather than accidentally discarded. The building also housed the two Model T Fords, yet neither vehicle could be reconstructed from the unearthen specimens: both were missing major parts such as engines, radiators, batteries, and wheels, suggesting the vehicles had been stripped of all usable and/or sellable parts. The owners of the building

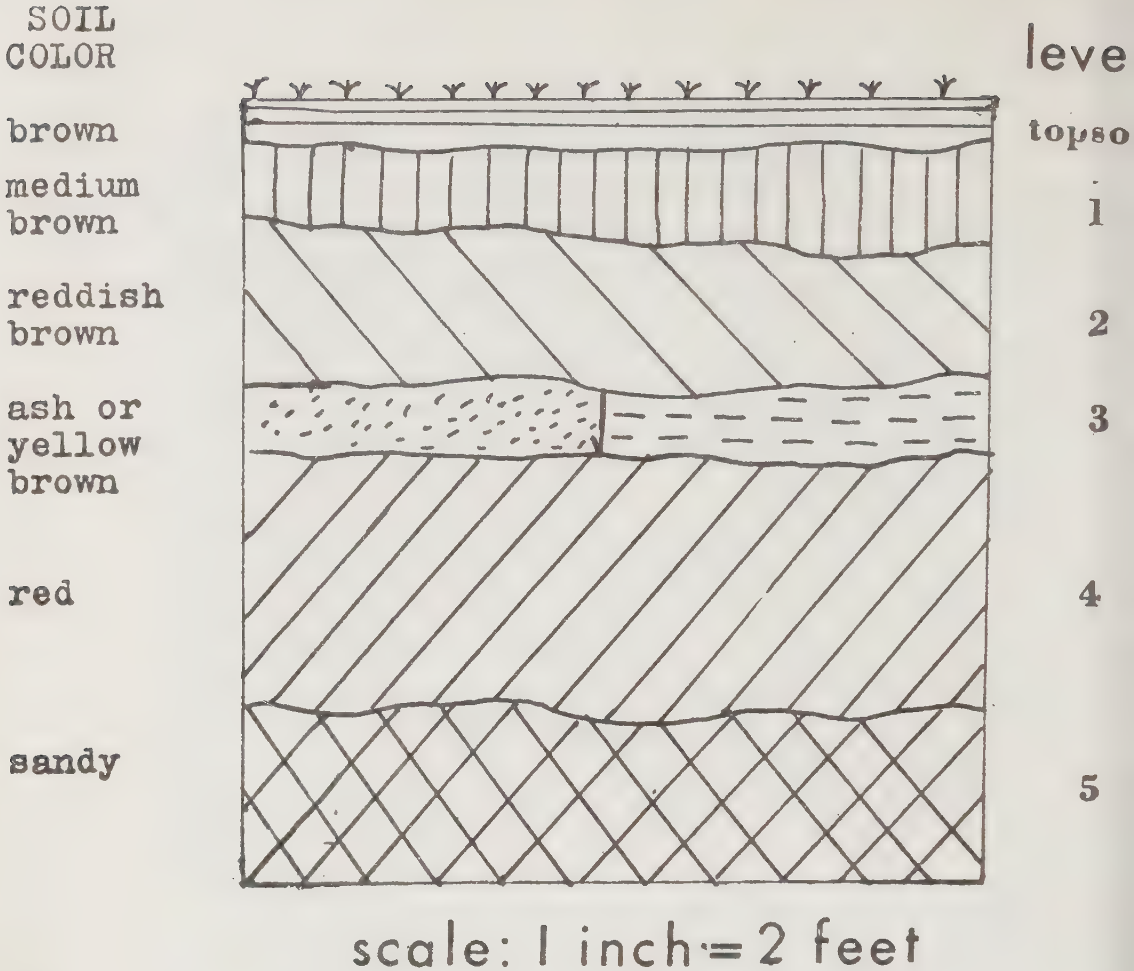

Fig. 4 A schematic soil profile for the squares dug within the foundation. Some ash was scattered throughout Levels 1 through 4.

probably removed all the valuable items and left all the nonsalvable objects, and the building was then destroyed. After it was demolished, the foundation was filled in with household refuse.

Lastly, the building seems to have been used as a garage rather than as a storage shed. The presence of the two Model T Ford drive shafts makes this plausible. The two drive shafts were found on the floor of the foundation and both frames were covered with slabs from the cement wall. It appears that the cement walls had been pushed down on top of the cannibalized vehicles and then refuse was thrown along side of and on top of the two Model T Fords. Because of the presence of the two Model T Ford drive shafts and all the automobile specimens, it is unlikely that this building was used merely as a storage shed. I feel that many of the household artifacts were deposited as fill after the building had been destroyed.

The Ethnoarchaeological Evidence

In order to assess the validity of the archaeologically derived conclusions, two former residents of lot 11 were consulted. Dorothy Bishop Azzara and Clementine Puntillo Vogt, the daughters of the former owners of the property, were interviewed. The Bishops owned lot 11 from 1919 until 1932 and the Puntillos owned the property from 1932 until 1953. Even though the City of New York Department of Parks took over ownership of the land in 1953, the Puntillos were allowed to remain in the house until 1963.

The two women were cooperative and helpful informants. The questions that they were asked were phrased as objectively as possible so as not to bias their answers. The informants provided me with valuable data about the construction and the land use of the site, in general, that were not available in any written records. In addition, Mrs. Vogt showed me various photographs (from her family album) of the site from 1930-1960. Therefore, I was able to test my conclusions about the garage with the data obtained from verbal and photographic sources.

Both women vividly remembered a barn (this is the large shed pictured in Figure 2). Mrs. Azzara stated that the barn was built before her parents obtained the land; she added that her father kept his cars and two cows in the barn/garage. Both women believe the barn was torn down by Mr. Puntillo shortly after he acquired the property in 1932. Neither informant could recall how the building was destroyed.

Only Mrs. Azzara could remember a small, one story shed on lot 11. She stated that her father (Frank Bishop) repaired his cars in the building. Frank Bishop was an engineer and was very interested in automobiles. At various times he owned a Model T Ford truck, a Model T Ford coupe, a Packard, an Essex and a Buick. In addition to repairing his own cars he would repair his friends' cars. This information removes the possibility that the garage was used as a professional body shop. However, this material does support the contention that the building was used as a garage/workroom.

Both informants were confident that the garage was not destroyed by fire. They both commented that they would have remembered an event as memorable as a fire. Although the women were uncertain as to the demise of the one-story building, they both felt it was purposefully destroyed by Mr. Puntillo in 1932. This information supports the interpretation that the garage was demolished rather than being accidentally destroyed by fire.

After combining archaeological, historical and ethnoarchaeological data, a number of statements can be made: this was a one-story building, 16 feet wide and approximately 25 feet long. It was built on

lot 11 sometime between 1912 and 1917. The building had a cement foundation and a frame structure and was used as a garage/workroom by Frank Bishop. Mr. Bishop, an engineer, repaired both his own cars and his friends' cars in the garage. Mr. Puntillo, a barber and owner of a barbershop, acquired title to lot 11 in 1932 and he demolished the garage within that same year. Some household refuse, from the Puntillo family[4], was added to the materials left in the garage by the Bishop family providing fill for the garage foundation. This fairly complete picture of the history and use of this building was only made possible by combining archaeological, historical, and ethnoarchaeological data.

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[4]Rita Puntillo Bourna, the sister of Clementine Puntillo Vogt, saw photographs of the artifacts and recognized that some of the pot sherds came from her mother's dishes.

Aulacodiscus Species of Kusnetzk Flora

by Joseph F. Burke and Warren E. Flint

This locality produced the material, discovered by Professor A.P. Tschestnoff, the flora of which was illustrated and described by Josef Pantocsek in *Beiträge zur Kenntniss der Fossilen Bacillarien Ungarns*, vol. 2, 1889 and vol. 3, 1893.

Kusnetzk is in the Gouv. Saratov (oblast) of the U.S.S.R. and is located 53° 07′ north latitude and 46° 36′ east longitude. Although lying in the general area of the Simbirsk flora[1], it has its own assemblage of Aulacodiscus species. The Kusnetzk Aulacodiscus flora is unlike that of the Simbirsk flora, the Singiliewsky flora[2] or the Kamischev flora[3]. Pantocsek referred to some of the species as odd.

The sample of material upon which this present study is based is one that was distributed to members of the Quekett Microscopical Club, of England, ex A. Morley Jones, and was received in 1966.

The species, described by Pantocsek, present in the Quekett sample were:

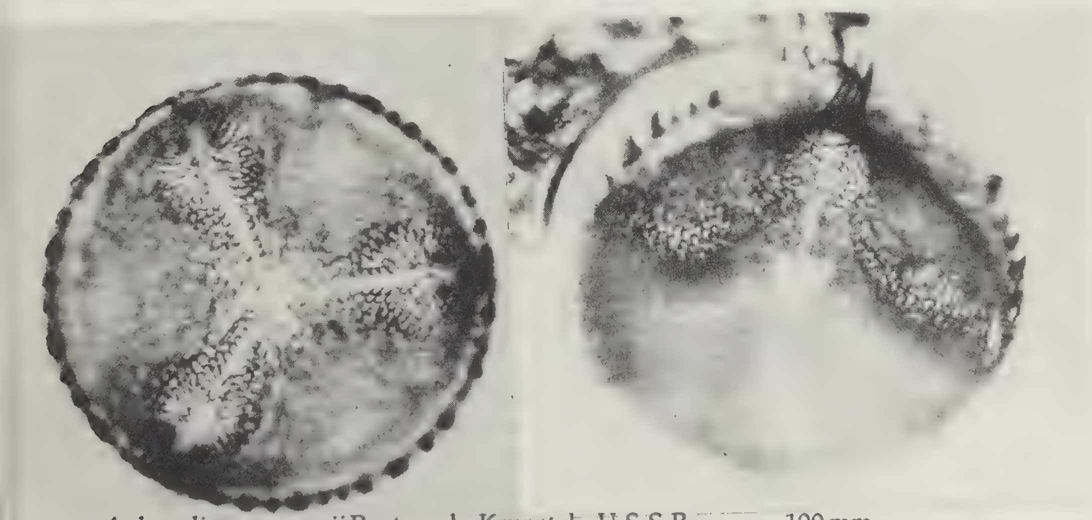
A. darwinii Pantocsek
A. gurowii Pantocsek
A. kelleri Pantocsek

Also found was:

A. excavatus var. *robustus* Hustedt

a species published in *Atlas der Diatomaceenkunde*, pl. 459, figs. 5 and 6, and pl. 460, figs. 1 and 2, in 1944.

A. darwinii, not a well established species, was found in fragments, one of which was large enough to indicate a valve with 5 processes, perhaps of the shape of *A. archangelskianus* Witt.



Aulacodiscus gurowii Pantocsek, Kusnetzk, U.S.S.R. .100 mm.
Two aspects of the same specimen are shown.

A. gurowii, similar in form to *A. excavatus* var. *excavatus* Schmidt is distinguished by its strongly dentate rim.

A. kelleri, as Pantocsek said, is an odd species and the published illustrations[4] indicate an incomplete valve and possibly an inner plate. If so, it is not clear to which species it relates. Usually with three or four primary rays, two of the illustrations with six primary rays only add to the uncertainty.

A. excavatus var. *robustus* comes in two forms, one of which has large robust areolae and complies with Hustedt's naming. Other specimens which otherwise have the same general aspect have smaller areolae comparable to those found in *A. excavatus* var. *excavatus* of the Simbirsk flora and the areolae cannot be considered to be robust.

There are other species named by Pantocsek from Kusnetzk that were not found in the Quekett sample:

A. nigrescens so named because of the black appearance, is small and highly convex. Undoubtedly it is rare. While not found in the sample used in the present study, a specimen from a different sample has been available.

A. peragalloi was not found. A number of specimens, from different lots of Kamischev material[3] have been examined and seem to be this species, although Kusnetzk and Kamischev floras are dissimilar.

A. interruptus was not found. This would seem to be an inconstant variation of *A. excavatus* var. *excavatus* or of the variety *robustus*. A specimen of the latter, showing the three lacunae, from one of the newer Russian localities, is in the Brigger collection.

A. tschestnovii was not found. F.C. Wise[5] found occasional fragments over many years and finally a complete specimen which he felt indicated Pantocsek's figure was an excellent representation of this species.

A. ledebourii was not found.

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1. Joseph F. Burke and Warren E. Flint, *Proceedings Staten Island Institute of Arts and Sciences*, 27:59. 1973.
2. ibid, 28:18. 1974
3. ibid, 29:7. 1977.
4. Josef Pantocsek. *Beiträge zur Kenntniss der Fossilen Bacillarien Ungarns*, vol. 2, pl. 5/77, 79. 1889.
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   L. J. Laporte & P. Lefebure, *Diatomées Rares et Curieuses*, vol. 1, pl. 14/94. 1929.
   Friedrich Hustedt, Atlas der Diatomaceenkunde, pl. 456/5, 6. 1944.
5. F. C. Wise, *The Journal of the Quekett Microscopical Club*, (4) 4:314. Nov. 1956 (published Jan. 12, 1957.)

The Gull Colonies at Hoffman and Swinburne Islands 1978

by Norma and William Siebenheller

Fourteen years ago, in 1964, Howard Cleaves discovered a colony of herring gulls breeding on Swinburne Island, the smaller of the two man-made islands which lie off South Beach (Staten Island, N.Y.), in the Lower Bay. At the time of his first visit there (*The New Bulletin*, Vol. 14, No. 2) the colony numbered 105 nests and was perhaps several years old.

Obviously it had grown in the intervening years. We knew it had spread to include both islands, and we suspected that it included at least one additional species, the great black-backed gull. We were anxious to see it for ourselves so that we might have first-hand information for the Breeding Bird Survey, now being conducted by members of the Nature Section of the Staten Island Museum.

Accordingly we were delighted when Chris Schillizzi, Naturalist at Great Kills Park, was able to arrange a trip for us on May 22, 1978, using a Park Service boat. The islands, now part of the Gateway system, are off-limits to private individuals, so without Chris' help we could not have gone.

Accompanying us, too, was Robert Clermont, making a total of four in the party.

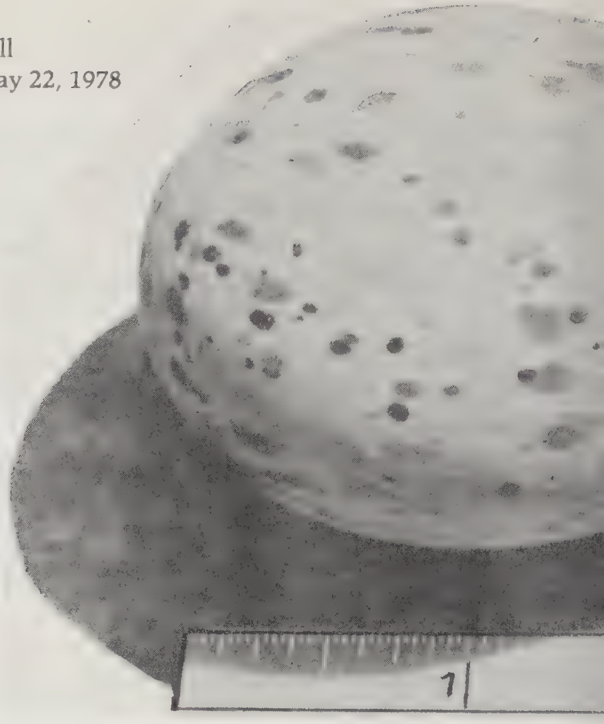
The weather was warm and sunny and the seas were calm, but even under such ideal conditions it was no easy task to bring the boat in close enough so that we could climb up over the rocks which surround the islands. As we approached Hoffman Island, our first stop, the hundreds of gulls sitting and standing on the rocks watched us with apparent unconcern. Many, we could see, were sitting on nests built in the rock crevices; all within our view were herring gulls. Some great black-backed gulls could be seen flying above, and an occasional cormorant flew by. The birds appeared to be used to seeing boats near the shore.

When we landed, however, the picture changed. We were no longer passers-by; we were intruders, and the gulls reacted accordingly. They rose in squawking flocks into the air, circling and wheeling above our heads in great agitation.

Since this activity exposed the gulls' eggs, we did not linger long in any one section, but moved around the perimeter of the island. Soon the birds became somewhat accustomed to our presence, and only those in our immediate vicinity left their nests.

The nests themselves were everywhere: on the rocks, on rotting pilings and walkways, and all over the ground. They seemed to be placed at random, often within three feet of each other. Most contained two or three eggs. Some were "two story" affairs, with the

Left: egg of Herring Gull
Right: egg of Great Black-backed Gull
Both obtained at Hoffman Island, May 22, 1978
(Photo by Dave Siebenheller)



current nest being built on top of a previous one; this, however, was the exception rather than the rule.

In examining the eggs we found great variations even among those from the same nest. They ranged from brown, blue and green to near-white in color, although all were heavily speckled, and from oval to short-oval in shape. Almost all measured 2.8 inches in length—the size given in our reference books for a herring gull's egg.

After much searching, however, we finally found a nest containing eggs that were noticeably larger; we found them to measure 3.2 inches. These, we felt, were certainly the eggs of the great black-backed gull. Then, just as we were leaving the island, we obtained the final proof of their nesting: we saw a great black-backed gull rise up from a nest, and we were able to photograph one of its eggs with that of a herring gull. (See photo.) This great black-back's egg, too, measured 3.2 inches.

Much the same conditions were found at Swinburne Island. We did, however, see some second and third-year gulls at Swinburne; there had been none at all at Hoffman Island. At Swinburne the nests were not quite so closely spaced, though there were a great many, and a few were even placed inside the decaying buildings. The proportion of great black-backed nests to herring gull nests was higher at Swinburne—perhaps 5%; at Hoffman, it did not exceed 1%.

We estimate there are perhaps 1000 nests altogether. Statistics provided by Dr. Paul A. Buckley and Fran G. Buckley show 825 herring gull nests and 8 great black-backed gull nests for the year

1977, and we suspect that 1978 figures will exceed that slightly.

Very few of the eggs were hatched on the day that we visited. We found only one nest of downy young on Hoffman Island (with one egg partially pipped), and two such groups on Swinburne.

We found no evidence of any other species nesting on either island. Several cormorants rested on pilings just off Swinburne Island, but there was no indication that they were breeding nearby. They were not disturbed at all by our presence. We saw no other birds at all, with the exception of a single spotted sandpiper on the shore.

The islands are littered with bones, and with the carcasses of gulls which had recently died. From the number of bones—which covered virtually every square foot of ground—it is apparent that gulls have been living and dying here for many years.

We observed a very curious phenomenon for which we have no ready explanation: there are, without exaggeration, hundreds of small balls all over both of the Islands. There are tennis balls, rubber balls, plastic "wiffle" balls, and every other type imaginable within a general size range (up to 3" diameter). There is no way for this to be accidental; the balls were almost certainly brought there by gulls. That the balls play some role in the courtship and nesting process is strongly suggested by the fact that Chris Schillizzi, on his first trip to the islands in early May, saw one ball in a nest along with the eggs. At this point we can only speculate as to the purpose this serves. We have found no reference to this habit in ornithological literature to date.

BIG DAY BIRD COUNT—May 20, 1978

The fourth annual Big Day Bird Count on Staten Island continued in the tradition set in the previous three, amassing a higher total than ever before recorded and topping last year's high by four for a final count of 147. Howard Fischer and Alan Rennie, working as a team, recorded 116 species for the individual high score for the day and the highest individual total in the history of the count.

Cool weather during the previous two weeks delayed somewhat the arrival of many species and no doubt played a part in this year's high scores. The largest wave of migrants reached Staten Island on Thursday, May 18, and many of them were still here to be counted on the 20th. More than a week of rain preceded the count, but the Big Day itself was warm and sunny, with temperatures reaching 90° F. There was no appreciable wind.

Twelve species were noted for the first time on a Big Day, including the nesting great horned owl. Great Kills Beach produced two new species: the American oystercatcher, and several white-rumped sandpipers. Blue-gray gnatcatchers and rusty blackbirds were late migrants.

Pine siskins were seen again at a thistle feeder in our own back yard, as they had been in 1976.

The cumulative total, after four Big Day counts, stands at an impressive 183 species.

—Norma and William Siebenheller

Number of observers: 18
Hours: Dawn to dusk
Species seen: 147

Common loon
Horned grebe
Pied-billed grebe
Double crested cormorant
Great blue heron
Green heron
Little blue heron
Cattle egret
Great egret
Snowy egret
Louisiana heron
Black-crowned night heron
American bittern
Glossy ibis
Canada goose
Brant
Mallard
Black duck
Gadwall
Green winged teal
Blue winged teal
American widgeon
Wood duck
Greater scaup
Red-tailed hawk
Broad-winged hawk
Marsh hawk
Kestrel
Ring-necked pheasant
Sora
Common gallinule
American Oystercatcher
Semipalmated Plover
Killdeer
Black-bellied plover
Ruddy turnstone

American woodcock
Spotted sandpiper
Greater yellowlegs
Lesser yellowlegs
Purple sandpiper
White-rumped sandpiper
Least sandpiper
Dunlin
Short-billed dowitcher
Semipalmated sandpiper
Sanderling
Gt. black-backed gull
Herring gull
Ring-billed gull
Laughing gull
Bonaparte's gull
Common tern
Least tern
Mourning dove
Yellow-billed cuckoo
Screech owl
Great horned owl
Whippoorwill
Common nighthawk
chimney swift
Ruby-throated hummingbird
Belted kingfisher
Yellow-shafted (common) flicker
Hairy woodpecker
Downy woodpecker
Eastern kingbird
Great crested flycatcher
Willow flycatcher
Least flycatcher
Eastern wood pewee
Olive-sided flycatcher
Horned lark
Tree swallow
Rough-winged swallow
Barn swallow
Purple martin
Blue jay
Common crow
Fish crow
Black-capped chickadee
Tufted titmouse
Red-breasted nuthatch
House wren
Long-billed marsh wren
Mockingbird
Catbird
Brown thrasher
Robin
Wood thrush
Swainson's thrush
Gray-cheeked thrush
Veery
Blue-gray gnatcatcher
Cedar waxwing
Starling
Solitary vireo
Red-eyed vireo
Warbling vireo
Black and white warbler
Blue-winged warbler
Tennessee warbler
Nashville warbler
parula
Yellow warbler
Magnolia warbler
Cape May warbler
Black throated blue warbler
Yellowrumped warbler
Black throated green warbler
Blackburnian warbler
chestnut sided warbler
Bay breasted warbler
Blackpoll
Prairie warbler
Ovenbird
Northern waterthrush
Louisiana waterthrush
Yellowthroat
Hooded warbler
Wilson's warbler
Canada warbler
American redstart
House sparrow
Bobolink
Eastern meadowlark
Red-winged blackbird
Baltimore oriole
Rusty blackbird
Common grackle
Brown headed cowbird
Scarlet tanager
Cardinal
Rosebreasted grosbeak
Indigo bunting
Purple finch
House finch
Pine siskin
American goldfinch
Rufous sided towhee
Savannah sparrow

Grasshopper sparrow
Field sparrow
White crowned sparrow
White throated sparrow
Swamp sparrow
Song sparrow

Birds seen for the first time on a Big Day include:
Louisiana heron
American widgeon
Sora
American oystercatcher
White rumped sandpiper
Yellow-billed cuckoo
Great horned owl
Willow flycatcher
Olive sided flycatcher
Blue-gray gnatcatcher
Louisiana waterthrush
Rusty blackbird

The total for four years (cumulative) is 183 species.
Weather: 85-90°F; sunny, no appreciable wind.
Area: All of Staten Island—beach, marsh, fields, woodlands, residential areas, feeders, lakes, ponds, garbage landfill.

NATURAL HISTORY RECORDS OF STATEN ISLAND
January 1, 1975 to December 31, 1977

These records were compiled from the Section of Natural History Minute Books and the Study Group Minute Book. They also include the reports of the Nature Section's Field Trips.

Code: FT = Field Trip Reports
SG = Study Group Minutes
No letters after date = Minutes of the Section of Natural History

—Prepared by Mathilde P. Weingartı

PLANTS
Kenneth Lewis List of Observation 9/77; 11/77
Norma and William Siebenheller List of Observation 3/76
American Holly 3/76 FT
Ash-leaved Maple 10/75 FT
Bald cypress 5/77; 4/77 SG; 4/77 FT; 5/77
Bartram oak 5/77
Black willow 7/77
Bluets 5/76 FT
Bottle gentian 8/75 FT; 10/76; 10/77; 10/77 FT
Broom rape 5/76 SG; 5/76
Cardinal flower 8/75 FT
Cedar of Lebanon 2/75 FT; 5/77
Chestnut oak 5/77

Phoebe 3/76 FT
Pied-billed Grebe 1/77 FT
Pine siskin 1/76; 2/76; 3/76 FT; 6/ SG
Pintail 4/75
Prothonotary warbler 4/77
Purple finch 5/75; 4/76
Purple martins 4/75; 8/76; 4/77; 8/77
Purple sandpiper 2/76
Red-breasted nuthatch 1/76; 8/76
Red crossbill 1/76
Red-headed duck 2/77 SG
Red-headed woodpecker 1/76
Redpolls 4/75; 1/76; 2/76 FT
Red-tailed Hawk 11/76, 12/76 SG; 11/77
Ross' gull 3/75 SG (Massachusetts)
Royal Tern 8/76
Rusty blackbird 11/76
Sawhet owl 11/75 SG
Sharpshinned hawk 10/77 FT
Short-eared owl 2/76, 12/76 FT
Snipe 11/76 FT
Snow bunting 11/75, 2/77 SG, 11/77 SG, 2/76, 11/76 FT, 11/77 FT
Snow goose 11/77 SG, 10/77 FT, 11/77
Snowy egret 9/75 FT, 3/77 FT
Snowy owl 2/76, 2/77
Sora rail 11/76
Tree swallows 4/77 SG
Tree sparrows 2/77
Vesper sparrow 4/76 FT
Virginia rail 11/76, 2/77
Widgeon 4/76 FT
Carolina wren 12/76 SG, 3/76, 10/76, 11/77
Winter wren 10/76
Woodcock 5/75 FT, 5/75, 1/77
Wood duck 3/77, 4/77, 5/77
Yellow-bellied sapsucker 10/76
Yellow-crowned night heron 4/76 FT
Yellow-throated warbler 4/77

THE POND SURVEY, Staten Island, New York. 1975-1976. Part IV.

Bunker Pond and Little Bunker Pond

by Albert J. Hendricks, Ph.D.

The next pond in this hydrosere (see Part III) is Bunker Pond, which is the third largest in the series, coming after the "younger" Acme and Arbutus Ponds. As described earlier, it is between Hylan Boulevard and Raritan Bay, opposite the intersection of Stecher Street with the boulevard. It is some eighty yards south of this intersection in a shallow hollow that perhaps represents the remains of a glacial kettle. In any case, to the south and east of the pond, heavily wooded, steep and fairly high hills separate and protect the pond from excessive influence by the sea. The scene of this pond in its wooded hollow is beautiful to gaze at, and it is a favorite fishing haunt of boys from the nearby Bernstein Intermediate School, and Tottenville High School.

Characteristically, the relatively mature deciduous woods come right up to the banks of the pond and hang over it. While the main trees in the canopy were observed to be pin oak, sweetgum and white ash, numerous specimens were also seen of scarlet oak, black birch, shellbark, shagbark, mockernut, and pignut hickory; white oak; and

red maple. The rather luxuriant tall second story is mainly made up of black birch, nannyberry (*Viburnum lentago L.*), white oak, and red maple. However, also represented in this stratum are occasional individuals of beeches, sassafras, and iron wood (*Corpinus caroliniana* Walt.). The short second story is mainly of saplings of various species of hickory, black birch, white oak, American chestnut; and bushes of black haw, arrowwood, and spicebush. Leaf-litter on the ground is thick, and is interspersed with thousands of false Solomon's seal herbs. Catbrier is thick and clambers over low plants of arrowwood, spicebush, American chestnut, maple-leaf viburnum, hickory, and sassafras. The water of the pond during the summer was normally transparent, but the color of dark brown tea. Quite a number of yellow pond lily colonies were noted around the pond, and occasional small, free-floating colonies of bladderwort were seen. In late May, the true green alga, *Spyrogyra* sp., was found to form a rather thick, felt-like layer on most of the pond's bottom. In the later part of summer, floating colonies of small size of acid-tolerant Desmid algae such as *Micrasterias* sp., *Spondylosium* sp., made their appearance. Also, mixed in with these were myriads of another common Desmid, *Cosmarium* sp. Late in July, numerous specimens of the hollow-ball colonies of *Volvox* sp. were also noted and collected.

Generally, pondweed productivity was low, and a decaying leaf layer on the pond bottom could be seen along the shoreline. Macroscopic animal life was abundant and included gray aphids feeding on pond lily pads, clouds of Midge flies, which were also represented in the water by their larvae (*Tendipes tentans* and *T. attenuato*), and nymphs of a damselfly (*Ischnura verticalis*). There were also great numbers of the worm, *Deros digitata* (Oligochaeta), snails (*Physa* sp. and *Helisoma* sp.), and a planarian (Turbellaria: *Dugesia tigrina*). The water was also observed to be rich in seed shrimps (Ostracoda: *Eucypris virens* and *Cyprinotus incongruens*), *Cyclops* sp. (Copepoda), and *Bosmina longirostris* (Cladocera). Identified from plankton samples were microfauna such as *Difflugia urceolata*, *Amoeba proteus*, *Paramecium aurelia*, *Paramecium caudatum*, *Colpoda cuculus*, and *Vorticella* sp. Microphyta included Euglenoids such as *Euglena viridia*, *E. gracilis*, and *Phacus longicauda*. Also, there were identified algae of species of *Pinnularia*, *Navicula*, *Tabellaria*, *Cymbella*, *Meridion*, *Cyclotella*, *Oscillatoria*, *Spirulina*, *Ankistrodesmus*, and *Staurastrum*.

Fishermen were observed to catch numbers of small bluegills, green sunfish, and infrequently, small specimens of large-mouth bass. Bullheads are said to be in the pond also. Some American eels (*Anquilla bostoniensis*) were caught there.

LITTLE BUNKER POND

This little pond, geographically very close to Bunker Pond, is at a late stage in the hydrosere with numerous eutrophic features. It is located about sixty yards east of Bunker Pond, to which it is connected by a small creek that is often dry. However, the two are visually separated by a large, heavily wooded hill so that most visitors to Bunker Pond do not see or know about this one. The best way—though not an easy one—to get to the pond is off Hylan Boulevard just opposite where Rockport Street intersects the Boulevard. The pond is small, being only about 400 feet long by some 130 feet wide (about one and a quarter acres). It is choked with pondweeds and pond margin plants.

On the side of the pond closest to Hylan Boulevard, the arborescent vegetation is much like that around other ponds in the series, but on the south shore, the woods are more typical of drier, upland sites. The canopy of trees here is mainly of white oaks and chestnut oak (*Quercus prinus* L.), while woody plants of the tall second story are mainly white oaks, chestnut oaks, beeches, and sassafras trees. Uncommonly, some fair-sized trees of American chestnut can also be seen growing in this location.

At the short story level, the most common woody plants are beeches, American chestnuts, white oaks, sassafras saplings, and pinxter-flower bushes. These woody plants come right up to the water's edge, and greatly reduce areas where a shrub zone might grow. However, at both the east and west ends of the pond, there are some mud flats that have extensive colonies of the semi-woody rose mallow, with occasional clusters of soft rush mixed in with the mallow. These share what little space there is on the west side with numerous swamp loosestrife plants. Rimming the pond edge there were considerable numbers of arrow arum, while the main body of shallow water was observed to be virtually covered with floating leaves and flowers of yellow pond lily. Wherever a bit of water was seen, large numbers of big duckweed, and lesser amounts of watermeal (*Wolffia columbiana* Karst.) drifted about. Some of the lesser duckweed was seen, too. At the west end of the pond, where the mud flats end and the swamp woods begin, a narrow green verge—very boggy in nature—was seen. It is primarily made up of a mixture of sphagnum moss, St. John's-wort, and spike rush. Where the inlet of the creek connecting this pond to Bunker Pond comes into the pond, this verge is largely replaced by skunk cabbage (*Symplocarpus foetidus* (L.) Nutt.), which is more characteristic of swamp woods.

The usual wide variety of dragonflies, damselflies, water striders, aphids, and other insects previously found on or around other ponds in this ecosystem is present also here at Little Bunker Pond. But no fish were seen, and only a few bullfrogs were heard. One uncommon freshwater clam was found—the small pill clam (*Pisidium dubium*).

Bunker Pond and Little Bunker Pond
by Hans J. Behm, M.S.

Bunker Pond ("Hidden Pond" according to some naturalists), is located 310 feet southeast of the intersection of Hylan Boulevard and Kingdom Avenue. This pond is delineated on the 1913 topographic map. Its shape and outline have changed very little. The greater diameter is 325 feet and its width is 220 feet. The depth averaged two to three and one-half feet and its total surface area is a little less than one acre. Elevation is 40 feet above sea level. The inherent color was a greenish-brown. No significant sedimentation patterns were observed. Although not shown on the 1913 topographic map, an outflow channel is present at the northern terminus of the pond, which empties into Little Bunker Pond.

Geologic Setting. Bunker Pond occupies a kettle and is located on glacial till of the terminal moraine. The pond is surrounded by ridges and hummocks of the moraine and Bunker Hill, 70 feet high, is located to the south. The glacial banks around the periphery of the pond are thickly covered with many stately and beautiful trees, producing a truly sylvan setting. The lush vegetative cover prevents excessive erosion during periods of high rainfall.

The bottom muds of the pond reek with H_2S gas. Methane, or marsh gas, escaped when the bottom was disturbed.

The stratigraphic sequence beneath the pond is as follows: glacial till of the terminal moraine; three to six inches of a decomposing humic layer; and, a thick layer of black organic muds.

Description of Sediments. The sediments are composed of classical Wisconsin till, ranging in particle size from clay to boulder. Many compositions, shapes, and densities are represented. The sediments are reddish-brown due to the incorporation into the till of reddish shales and sandstones of the Upper Triassic Newark Group. Individual pebbles and cobbles are subangular to subrounded; some are rounded, elongate, or equidimensional. Gneissic and granitic constituents are common. The rest consists of quartzites, conglomerates, some basic igneous rocks, jasperoid material and several varieties of shales and sandstones, which have undergone differential weathering.

Microscopic Description of Sediments. The small fraction of the processed sediments contains much clear, semitransparent, angular, subangular, and subrounded quartz. Also present are some angular to subangular, and a few rounded grains of milky white quartz; some angular, subangular, and subrounded pinkish and reddish quartz; some ferruginous quartz; quartzitic fragments, jasper, and some rounded and frosty grains of quartz in the coarser fraction. In addition, there is a variety of fragmental gneiss and granite, arkose,

and the shales and sandstones of the Newark Group, which are mostly reddish-brown. Pinkish feldspar, actinolite, chlorite, magnetite, mica, and some yellowish sandstone are also present.

Note. Many of the mineral grains are coated in whole or in part, with a blackish-brown lacquer-like layer (due to tannic acid?). Many of the fragmented leaves also are covered with this substance.

Microscopic Description of Faunal and Floral Constituents. The sediments contain much plant debris, and abundance of chitinous insect parts, and many seeds. Some charred plant debris is also present, including the oogonia of the charophyta. The Testacida include *Difflugia oblonga* Ehrenberg and *Difflugia corona* Wallich. The ostracoda are well represented by *Cypridopsis vidua* (O.F. Muller), *Eucypris virens* (Jurine), and *Cyprinotus incongruens* (Ramdohr). Gastropods are common and the finer residues contain a great variety of fresh-water diatoms. The periphyton revealed many desmids, testacida, ostracoda, gastropods, and planarias.

Comments on the Weather. May 23, 1975 was a warm but hazy day. Wind intensity was 5 to 10 knots and the visibility was fair.

LITTLE BUNKER POND

This small, swamp-like pond is located north of Bunker Pond, 140 feet southeast of the intersection of Hylan Boulevard and Rockport Street. The pond receives the outflow waters from Bunker Pond. It is approximately parallel with the boulevard and is well below street level. The length is ca 410 feet and the widest point is 130 feet. The overall surface area is less than three-quarters of an acre. Most of the pond is thickly covered with aquatic vegetation but an open area exists in the center. The pond is shown as a swamp on the 1913 topographic map. The depth averaged one to two feet. The elevation is 25 feet above sea level. Like Luten Pond, this fresh-water body is thickly vegetated and is on its way out as far as its evolution is concerned. The shore is muddy and a number of "bog-like" deposits are present in places. The bottom of the pond revealed much humus-like material and when disturbed, caused the water to turn intensely black due to the suspension of much oozy black organic mud.

Geologic Setting. The pond is located amid hummocky terrain of the terminal moraine, of classical Wisconsin age and occupying a kettle-like depression. Steep slopes occur south and southeast of the pond, 20 to 35° near the top of the hillocks and three to 10° at the bottom. Aqueous erosion has produced multitude of erosional gullies particularly south of the pond. The highest elevation of one hillock is 70 feet above sea level and 40 feet above the pond's level.

The stratigraphic sequence beneath the pond is as follows: till of the terminal moraine, black, earthy and humus-like material; a thin layer of finely-divided clay; and, a very fluid and gelatinous mud with much plant debris and a dense mat of vegetation.

Discussion. The interconnected tree canopy above shuts out enough light to prevent the growth of low shrubbery and grass beneath, exposing the steep terrain to aqueous erosion. Fallen tree trunks reveal a variety of bracket fungi and slime molds. A dense and low plant growth prevents further erosion along the gentle terrain along the periphery of the pond. But the 1975 rains were so copious and so sudden that much fine silt and clay material was deposited on the pond's bottom in the form of a thin and brownish clay layer just above a layer of decaying vegetation. This caused much marsh gas to accumulate beneath. *Fungi.* The following fungi were recorded: *Polyporus betulinus* Bull. ex Fries, *Polyporus* (*Polystictus*) *versicolor* L. ex Fries, *Daedalia quercina* L. ex Fries, *Collybia platyphylla* (Pers.) Quel., and *Panaeolus* sp., including many myxomycetes on fallen tree trunks and stumps.

Microscopic Description of Sediments. White and angular fragments of quartz are present in the fine fraction, whereas much coarse sand and gravel are present in the coarser fraction. Angular to subangular reddish grains of shale of the Newark Series are also present. Moreover the sediments include some fragments of white sandstone; granite and gneiss, some arkose, pink and white feldspar, and some mica. Some coke fragments and fly ash are also present.

Microscopic Description of Faunal and Floral Constituents. The coarser fraction revealed much plant debris and many seeds. The finer portion examined by me was barren. The periphyton, on the other hand, revealed a number of elongate statoblasts, volvox colonies, small diatoms, desmids and one ubiquitous ostracod, *Cypridopsis vidua* (O.F. Muller). The most common testacean is *Difflugia corona* Wallich.

Comments on the Weather. The weather was clear and a few clouds, mostly *Cumulus*, were present. The visibility was excellent.

BOOK REVIEWS:

Bird Flight, George Ruppell; Van Nostrand, Reinhold, N.Y. 1978, 191 pgs., 80 refs. $18.95

Dr. Ruppell's book rates as outstanding in a field of more than fifty publications since 1900. He excels in readability; scope of observation, coupled with specific photographic support and the coverage of species and geographic areas untouched in other works.

In aerodynamic analysis he is standard. Biologists are not at home in this area. When they lean on "steady state" aerodynamicists for support they do not understand the limitations of that approach. His notes and observations show plunging dives halted with a few wing beats to a step-on precision landing. Only substantial recourse to the now well-developed "unsteady state" aerodynamics can handle this.

Aside from this fact which is probably not of great importance to most readers, it is again an outstanding work, suitable for a wide variety of libraries.

References and index good, illustrations numerous and fine.

—James L.G. Fitz Patrick
Professor and Dean Emeritus

Field Guide to the Sea Shells of the World, by Gert Lindner. Van Nostrand, Reinhold Company. New York. 1977 $8.95

The reader is first struck by the very beautiful illustrations—both in black and white as well as color—which are in this book.

The author may be German and most of her data are derived from that literature (the book is translated from German). As a result the reader is left with the impression that much of the material reported upon deals with the eastern North Atlantic which is well represented. The shells of the rest of the world are not quite as well covered.

In addition, it is obvious that the book is meant mostly for the collector who gets most of his material from shell shops, dealers, fishermen, or divers. Since our less colorful East Coast species are not easily available from these sources, they were omitted except for occasional mention in a long list of species and genera under the title "Family." (The author in her Foreword had stated that hard-to-obtain specimens were not included in the book.)

If you make most of your collections from dealers, shell shops, or fishermen, rather than combing the beach or scuba diving in almost

any local area of the world, this in a very reasonable book for your use. The hand dredger or beachcomber will most likely not be able to find specimen identification in this book.

—Mathilde P. Weingartner

The Tiger Beetles (Coleoptera, Cicindelidae) of New Jersey with special reference to their ecological relationships. by Howard P. Boyd. (*Transactions of the American Entomological Society*, Volume 104:191-242. August 22, 1978.)

Charles W. Leng, a founder of the Institute and former Director of the Staten Island Museum, was widely known as an authority on the beetles. His *Catalogue of the Coleoptera of America, North of Mexico*, was widely used by specialists in this field. He also specialized and wrote on the tiger beetles, in which he was aided by the participation of his life-long friend, William T. Davis. Both of them actively collected not only on Staten Island but also throughout the neighboring state of New Jersey.

Much of their activity in collecting of the tiger beetles is now reflected throughout a newly published monograph, *The Tiger Beetles of New Jersey*. In preparing this work, Harold P. Boyd reviewed the Museum collections and incorporated the collecting records of Leng, Davis, and many of their contemporaries from whom they received specimens. Specimens they had transmitted to other museums and institutions are likewise recorded.

This publication is an updated record of the Cicindelidae of New Jersey. It will prove to be invaluable to students of our present generation making a study of the tiger beetles and acquaint them with the extensive forays of Leng, Davis, and other s of our people to the many attractive collecting areas of that state.

This monograph symbolizing the dedication of Harold P. Boyd to his specialty is a tribute to the activities of Leng and Davis in the formation over a period of some sixty years of so valuable a resource as the insect collections of the Staten Island Museum.

—Joseph F. Burke

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PROCEEDINGS
Staten Island Institute of Arts and Sciences

CONTENTS

Editor: G. K. Schneider

VOLUME 30 NUMBER 1

The Rediscovery of a Plethodontid Salamander on Staten Island

by William Thomas Rumph
Associate Director of Research, Staten Island Zoo

The rediscovery of a vertebrate species on Staten Island that has been cited as locally extinct for more than 25 years (Mathewson, 1955), is a definite turning point in the on-going process of species extermination taking place. The discovery of a Four-toed Salamander *(Hemidactylium scutatum)* on Sunday, March 4, 1979 near the edge of a fresh water marsh in the northwest shore area of the island, is such an occurrence. This specimen was brought to my attention on March 7, 1979 by Steve Wit, a young graduate of one of the Zoo's herpetology courses.

The specimen was a small juvenile (15 mm.—Snout-Vent length and 32mm.—length: Snout to tip of tail). Considering its size class, I believe it is a hatchling from the spring of last year. The salamander was found under dumped rubble, along the edge of a stand of Sumac and Ailanthus about one meter from the marsh. The air temperature at 2 P.M. when the specimen was collected, was about 12° C. under a clear sky.

I returned to this area on Saturday, March 10, 1979 at 11 A.M. to confirm the locality and collected a second specimen found under broken pieces of concrete. The air temperature at the time was approximately 10° C and the animal collected was a gravid female (Snout-Vent length 37mm. and Snout-to-tip-of-tail length 89mm). The salamander was very lethargic when found and was easily collected. A sympatric species was found in great numbers the Red-backed Salamander (*Plethodon cinereus*).

In *Hemidactylium scutatum,* the females typically approach the edge of a fresh water marsh or sphagnum bog in early spring and lay their eggs on land near overhanging bushes or trees. This interphase, between a marsh or bog and forest, seems to be critical to their selection of an egg-depositing area (Blanchard, 1923). The young hatch later in the spring and undergo a 6 to 8 week larval period in the fresh water, before transforming into terrestrial adults.

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A third search was made on Monday, March 12, 1979 at 3:30 P.M., but no Four-toed Salamanders were found due to the extreme drop in temperature that took place in the previous 24 hours. Soil temperature was 7° C and air temperature was only 5° C, with a strong breeze from the west. On Wednesday, March 21, 1979 a fourth observation was made and one juvenile was found. The area had already begun to dry. the air temperature was 17° C and soil readings were 10.5° C.

It is most important to note that this species is very sensitive to water pollution and locally the suitable area available to the salamander is extremely limited. For these reasons I personally recommend that this population be protected in some fashion immediately. This immediacy is even more important due to the fact that the population is found in a strip of land between two industrial areas.

(March 22, 1979)

References:

Blanchard, F. N.

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1955. Reptiles and Amphibians of Staten Island. *Proceedings*, Staten Island Institute of Arts and Sciences, Vol. XVII: No. 2. Fall 1955.

Editorial Note: Additional citation should be made of "The Salamanders of Staten Island, N.Y., in 1931" by George B. Wilmott, published in *Proceedings* of the Staten Island Institute of Arts and Sciences, Vol. 6: Pts. 2-4 (1931-1932), pp161-164.

THE POND SURVEY, Staten Island, New York 1975-1976. Part V.

ECOLOGY

by **Albert J. Hendricks, Ph.D.**

TURTLE POND

Located just northeast of the intersection of Kingdom and Jansen Streets, not too far from Bunker Pond, is a little-known green gem called locally Turtle Pond. A path through the woods winds toward the pond from Jansen Street among low trees of white oak, along with fewer numbers of red and scarlet oaks. The tall second story is mainly made up of beech, sweetgum, pin oak, and white oak. The short second story contains black haw, highbush blueberry, pinxter-flower, sweetgum, beech, gray birch, white oak and red chokeberry. Small paths run everywhere, and the ground cover of leaves is thin. There are also a relatively small number of tree and shrub seedlings amid the dead leaves such as beech, white oak, highbush blueberry, and pinxter-flower. On the east side of the pond, small open areas alternate with scrubby copses of trees and shrubs. In the shallows, on this side, soft rush, a fine-leaved spike rush, and some St. John's-Wort herbs were seen in large numbers. The latter two, along with sphagnum moss, were seen to form a narrow, bog-like green verge at scattered intervals along the water's edge. Trees and shrubs on this side consist of low sweetgums and red maples, plus a few arrowwood shrubs.

Perhaps the most impressive feature about Turtle Pond in the summer of 1975 was that its surface was almost entirely covered with the floating leaf pads and the flowers of yellow pond lily; and, any water that could be glimpsed was loaded with a bladderwort which floated just beneath the surface. It should be mentioned too, that leafy pondweed and mermaid weed were sometimes mixed in with the bladderwort. Analysis of the productivity of these pondweeds showed that they were growing at the spectacular calculated rate of more than 16,000 pounds per acre! Since the pond is only two feet deep, it seems clear that it will fill up in a very few years and will disappear.

The pond and its immediate environment abounded with frogs like peepers (*Hyla crucifer*), and bullfrogs. Cicadas could be heard - perhaps members of Brood 15 of *Magicicada* sp., – and noisy redwing blackbirds and purple grackles were frequent visitors to the pond. Macrofauna in the water were found to be made up of organisms like water mites, mayfly nymphs (*Stenonema exiguum*), and numerous larvae of *Pentaneura* sp. (Diptera). At the microscopie level, some of the more noticeable organisms were algae such as desmids (i.e., *Closterium moniliferum, Micrasteria pinnatifida,* and *Pleurotaenium nodosum*); blue-green algae (i.e., *Oscillatoria* sp.), and, at a smaller magnitude, great numbers of Ciliophora (i.e., *Paramecia* sp.).

LUTEN POND

Despite the relative recentness and artificiality of Luten Pond, which owes its existence to the damming action of close-by Luten Avenue and Hylan Boulevard, it nevertheless represents the last stage in this hydrosere. This stage is demonstrated at Luten Pond by the rather large numbers of woody shrubs near the center that are displacing semi-woody shrubs and tall herbs such as sedges, rushes, grasses, and weedy flowering plants. Additionally, the pond is only one to two feet deep, with a good layer of muck, and is clearly on the way out. When the muck and bottom sediments rise sufficiently to cause better drainage of waters away from the pond, terrestrial succession will begin when swamp woods replace the present swamp shrubs. Then, if nature were allowed to take its course, the pond-site would gradually go through hydric stages of terrestrial community succession until the Oak Disclimax would be achieved. This lengthy process which might take a century to happen is not at all likely to occur because of increasing needs and demands of human population.

At present the only woods associated with the pond is on the north of the pond, and to a lesser extent, on its east side. The trees in the canopy of this fringe woods were observed to be mostly sweetgum, but with some red maple and white ash present. The tall second story is mainly made up of sweetgum, with a few young white ash trees; and the short second story is a mixture of red maple saplings, shrubs of arrowwood, spicebush, and black haw. The ground was seen to have a good leaf-litter on it. Common catbrier is thick everywhere and often forms a dense, impenetrable tangle hanging from branches up to six or eight feet above the ground. On the ground, Virginia creeper and poison ivy vines compete for space with seedlings or young plants of arrowwood, spicebush, red maple, barberry, and other low plants. The bank of the pond along Luten Avenue has a few terrestrial bushes and low trees, such as dwarf sumac, black locust, and large-toothed aspen. Closer to the water, scattered colonies of red osier dogwood, tall reed grass, soft

rush, and a tall rush were seen. Toward the water's edge, plants like butter-and-eggs, umbrella-sedge, bitter dock, spike rush, St. John's-wort, horsetail, dotted smartweed, and other annual or perennial water-tolerant herbs were found. Elsewhere around the sides of the pond, a good shrub zone was seen in a number of places. On the east side, one quadrat encompassed a tall, bushy common elder entangled below with some blackberry brambles, common catbrier, and vines of wild yam.

At other pond-side locations, buttonbush alone, or sometimes mixed with swamp loosestrife, comprises the shrub zone. In fact, the entire southeastern corner of the pond consists of cover by these two shrubby plants with their lower stems and roots in pond water. In more open water, scattered colonies of yellow water lily were seen to occupy much water-surface, while floating just beneath the surface, considerable volumes of leafy pondweed, a false loosestrife, and mermaid weed were observed drifting around or becoming rooted in the pond bottom muck. Occasionally, many-stalked colonies of mild water pepper, or St. John's-wort, vied for space on the water's margin with low sedges such as sallow sedge and spike rush.

Again, numerous kinds of dragonflies, damselflies, midges, mosquitoes, water insects, algae, and microfauna common in or around other ponds in this ecosystem were seen here also. Many snails such as *Physa* sp. and *Helisoma* sp. were noted too. Fowler's toads and bullfrogs were numerous, but no fish were seen. To reiterate, the outstanding feature of this pond is that it is really already in the last state of the hydrosere for ponds in this region, wherein woody shrubs can be seen to predominate in and over pond water.

"SPRING" POND

This pond is somewhat anomalous in the group of ponds in the ecosystem on terminal moraine at lower elevations because it is clearly not only artificial in nature, but is still being fed by "spring" waters that are undoubtedly emerging from a broken city water main not more than twenty yards from a city fire hydrant on Philip Avenue, about two blocks north of Hylan Boulevard. The patches or copses of woods around the pond were seen to be low, scrubby thickets for the most part, dominated by sweetgum trees in the canopy. The short second story consisted of gray birch and sweetgum saplings primarily, along with lesser members of red maple, sourgum, pin oak, and chokeberry plants. Ground cover was seen to be light, being made up of seedlings or young plants of red oak, red maple, sweetgum, and sourgum.

However, several environmental factors indicated a widely fluctuating water level that could account for this poor ground cover. In

almost every low spot in the adjoining woods around the pond, great colonies of mild water pepper lay exposed in tangled mats in a condition that obviously indicated that these plants had formerly and recently had their stems and leaves supported by embracing high water. Also, on the north side of the pond, three dozen or more dead trees were noted to be standing in the water, which supposes that they were "drowned" by rising water, or by pond water with fluctuating heights. There were also little groups of these skeleton trees scattered here and there well out in the pond itself. Mixed in with these dead trees out in the pond, several colonies of buttonbush were observed growing in water as much as four feet deep. Several yellow pond lily colonies were floating just below these bushes and dead tree trunks and stumps. Pondweeds under the surface of the water such as leafy pondweed and bladderwort were found, but usually in reduced amounts compared to their presence in other ponds where they normally occur. This could be due in part to the evident fluctuating level of the pond's waters, but it might also be due to some extent to the chlorine or other substances entering the pond at the "spring." A sample of this "spring" water was found to contain 0.13 mg./1. of chlorine. However, certain other aquatic weeds, such as mermaid weed, some water starwort plants, and a number of false loostrife colonies were observed to be doing well in this pond. Emergent vegetation along its shoreline was thriving: spike rush, great numbers of mild water pepper, and Canadian rush. The usual common insects found around other ponds on Staten Island were found here too, despite fluctuating water levels, and the temporary presence of perhaps unusual amounts of chlorine in the water. Green darners, civil bluets, common skimmers, and clubtails skimmed over the water, while whirligig beetles, water striders, and water boatmen insects hurried about on the water surface film, or just under it.

Organisms identified in "Spring" Pond's benthos, periphyton, plankton, and floating components (on the water's surface, as opposed to suspended in the water for plankton), are: Benthos. Macroorganisms: statoblasts of *Pectinatella magnifica* (Bryozoa); some brown *Hydra* not other wise denoted. Microfauna: *Actinophrys* sp., *Spirostomum* sp., *Paramecium caudatum*, *Paramecium aurelia*, *Amoeba proteus*, and species of *Oxytricha*, *Colpoda*, *Vorticella*, and *Urocentrum*.

Algae: *Euglena elastica*, *Euglena acus*, and species of *Scenedesmus*, *Pleurococcus*, *Navicula*, *Pinnularia*, *Cyclotella*, and *Synedra*.

Periphyton. Microfauna: *Arcella discoides*, *Arcella vulgaris*, *Ophryoglena atra*, *Astasis trichophora*, *Paramecium caudatum*, *Frontonia Leucas*, *Colpoda campyla*, *Amoeba limax*, *Heterophyxys myriopoda*, *Centropyxis aculeata*, and *Difflugia corona*. Macrofauna: species of *Tubifex* worms, *Aeolosomas* worms, and the Water Flea, *Daphnia pulex*. Algae: *Euglena viridis*, *Perenema trichophorum*, *Pediastrum simplex*, *Pediastrum boryanum*, *Oscillatoria splendida*,

Tabellaria fenestra, Anabaena circinalis, and species of *Tetrapedia, Synedra, Pinnularia,* and *Navicula.*

Plankton. Macroorganisms: *Daphnia pulex.* Microfauna: *Paramecium caudatum, Astramoeba radiosa, Amoeba proteus, Vampyrella* sp., *Frontonia* sp., and species of *Stylonchia, Philodina, Synchaeta, Anapus,* and *Euchlanus.* Algae: species of *Chlamydomonas, Carteria, Scenesdesmus, Pleurococcus, Ankistrodesmus, Amphora, Achnanthidium, Pinnularia, Diatoma, Cyclotella, Synedra,* and *Navicula.*

Floating (on water surface). Macroorganisms: Statoblasts of *Pectinatella magnifica.* Microfauna: *Colpoda cucullus, Spirostomum ambiguum, Arcella dentata, Vorticella campanula,* and a species of *Uroleptus.* Algae: *Chlorella vulgaris, Pediastrum boryanum, Ankistrodesmus falcatus, Tabellaria fenestrata, Navicula radiosa,* and *Fragillaria capucina.*

Perhaps it should be noted in passing that many bullfrogs were heard as they noisily bellowed in defending their shoreline territories, and birds could be seen and heard such as the brown thrasher, tree swallow, and the red-headed woodpecker. Also, it was noted that despite the closeness to Hylan Boulevard and homes along Poillon Avenue, pheasants live in the brush near the pond, along with cottontail rabbits and opossums.

BLUE HERON POND

(This pond was not studied during 1975. It was selected for study in 1976 after discussions were held between officials of the Institute and the Staten Island Office of the Planning Commission. It is inserted at this point because it belongs, with "Spring" Pond as its southern neighbor, within this ecosystem.)

Blue Heron Pond, sometimes called Bean Pond, is isolated and well-hidden from the knowledge and view of most people on Staten Island, although it is evidently sometimes frequented by hikers, youthful fishermen, and bird-watchers, as evidenced by narrow trails around the pond and its vicinity. Another characteristic of the pond that aids its obscurity is its rather ephemeral nature: sometimes one can see it, and sometimes not. It can most readily be seen in the spring season, before tree and shrub foliage is out, after a month or so of enough precipitation to allow the pond's shallow basin to fill up. But, typically, by mid-summer the pond is obscured by foliage, and its water-level has dropped, while pondweeds and water-loving shrubs grow profusely in and over the pond, their greenery virtually making any water left invisible.

This pond is located in Annadale in a large, more-or-less secluded

tract of woodland, abandoned fields, and marshlands, bounded on the north by Amboy Road, on the south by Hylan Boulevard, on its west side by Poillon Avenue, and on its east side by Barclay Avenue. In general, the terrain is higher on the north and west sides of the pond, and declines rather gradually to the south toward Raritan Bay south of Hylan Boulevard. However, it should be noted that on the immediate north side of the pond, there is a low bluff area of some 10 to 40 feet in height that provides a rather steep drop down to the water's edge.

Since the surrounding terrestrial ecosystem of a pond greatly influences its character, description should first be made of landward vegetation, animals, soils, topography, and so on. Such description is particularly important in a closed pond, like this one where there are no major in-flowing or exiting streams; instead the pond is totally dependent for its water sources on seepage and drainage from its immediate surrounding slopes.

For the sake of convenience, description can be divided into the following associations: the woods at higher elevations in the tract; the intermediate area, burned-over in early 1975; the woods at lower elevations; the bluff area on the north edge of the pond; the shoreline ecotone; and, the pond ecosystem.

The Woods at Higher Elevations.

Some three hundred yards to the northeast of the pond, as the ground continually but gradually rises, there is a beautiful, mature subclimax woods dominated by a mixture of some tall and large tulip trees and sweetgums. Beneath these there is virtually no tall second story, but there is a dense short second story in which the arrowwood shrub predominates, although scattered spicebushes and blackberry canes can be seen, along with a few red maple and pin oak saplings. In April, there was an estimated 10-to-15% ground cover by the ubiquitous herb, false Solomon's seal. Also, a good leaf litter was observed to cover the rest of the ground. The dark brown humus beneath the leaf litter was observed to be up to about a half-foot deep.

The Intermediate Area, Burned-over in early 1975.

Starting some one hundred yards or so to the northeast of Blue Heron Pond, and continuing along its entire east side, a recent fire had raged across a shrub ecotone to the south of the woods described above, into an old field on the pond's east side. The burned scrub thicket of the ecotone had consisted of clumps of poplars, ranging in height from 25 to 30 feet, associated with several dozen sweetgum saplings, 15 to 20 feet high, and lesser numbers of tulip tree saplings about 15 feet high. All shrubs and saplings 12 feet high, or less, were not leafing out and appeared to be dead. All herbs, as well as all of the leaf litter, at the ground level were burned away.

Observations of the burned-over old field to the east of the pond in May indicated that an estimated 95% of the field was reduced to

nothing but a thin layer of black organic carbonaceous material. However, already there were literally thousands of slender common catbrier shoots, 2 to 5 inches high, springing up across the burned field. Occasionally, clumps of a rough grass — probably broomsedge — could be seen with some new leaves emerging. Numerous red maple seeds were scattered across the field's charred surface. Infrequently a dead-topped chokecherry shrub was seen, with new leafy suckers or shoots emerging at the ground level. One or two dozen sumac shrubs were seen to be dead at their tops, although here and there a few new sucker shoots could be noticed at the ground level in the middle of their branch bases. Rarely, an arrowwood shrub could be identified but with no signs of life.

At one location in the field, closer to the pond, a couple of sweetgum trees, about 25 feet high, were seen to be still alive. Beneath these, there was to be seen a short second story of some 15 to 20 clumps of sweetgum saplings 2 to 4 feet high, that appeared to be coming from underground stumps; but these saplings were all dead. Nevertheless, new suckers were already merging from the more-or-less buried stumps. Also, 12 to 18 gray birch saplings, one to two feet high, were seen to be growing out of the ground, presumably from still viable underground roots. A half-dozen cinnamon fern clumps, two to three feet wide, were observed in their charred condition, but already tall fiddleheads, 12 to 18 inches high, were seen to be forming circles at the peripheries of their underground rhizome systems. Here, also, were at least a hundred clumps of broomsedge, or perhaps some species of coarse bluestem grass. A little later, in favored locations across the field, individual colonies with hundreds of bellworts could be seen against the carbonaceous background.

The Woods at Lower Elevations.

To the south of the pond, and a little to the east, the old field gives way to a rich and lovely deciduous woods that was disturbed by the fire by only shallow incursions. Here, quadrat studies showed that the dominant trees of the canopy are sweetgums, with some from 45 to 50 feet high, although in some areas they may be only about 40 feet high. These can be seen in various admixtures with lesser numbers of sourgum, scarlet oak, tulip trees, pin oaks, white oaks, and hickories. In general, the tall second story beneath this canopy was observed to be rather thin, and consisted mainly of white oaks, sweetgums, sourgums, and red maples. The fairly dense short second story can be described as having considerable numbers of sourgums, arrowwood shrubs, spicebushes, and sweetgums. Lesser numbers were encountered of species such as red maple, scarlet oak, Flowering dogwood, and white oak.

The Bluffs near the North Side of Blue Heron Pond.

The ecotone on the small bluffs, some 20 to 30 feet above the pond and

roughly 35 yards to the north of it, is mainly a small copse of sweetgum trees, 30 to 35 feet high, along with a pin oak or two. The tall second story has a few sweetgum and red maple trees, some 20 feet high. The short second story, relatively dense in some spots, is a mixture of shrubs like tall blueberry, red chokeberry, and arrowwood with a few saplings of red maple and sourgum. At the foot of the bluff, and between it and the pond's edge, there is a small wet-meadow next to a scrubby woods. The meadow is mainly made up of broomsedge, bluestem, and switchgrass, while the scrubby woods nearby contains sweetgum saplings, several large sumac bushes, and one or two swamp dogwoods. While the leaf litter on top of the bluffs is thin and charred in spots, that below the bluffs is thick and no herbs or seedlings were observed, although quite a number of horsetails were seen. The humus was observed to be wet, dark and thick with much partly-decayed detritus.

Perhaps it should be noted that on the southeast side of the pond is another wet meadow in which secondary succession is well underway. At the water's edge is a slough occupied by great numbers of spike rush, while further back, up-slope, are large numbers of switchgrass clumps intermingled with new shrubs of hardhack and several small copses of gray birch. Also, occasional canes of blackberries are hidden in the tall grass, and scattered clumps of broomsedge can be seen. On higher ground, intruding colonies of red maple and sweetgum saplings, 6 to 9 feet high, can be seen. At lower areas, around the spike rushes, numerous hummocks of sphagnum moss grow and numerous plants of a sedge were noted.

The Pond Ecosystem.

Blue Heron Pond is shallow, being only one to two feet deep, and is senescent. It is choked with water weeds and water-loving shrubs. Mermaid weed covers an estimated 80% of the pond's bottom, thickly intermixed with mild water pepper. These two herbs form wide bands, 20 to 30 feet wide, along the entire shoreline, where along with floating bladderwort masses they cover 100% of the water's surface area. Stalks of the mild water pepper from the previous year's growth projected everywhere across the pond and gave mute testimony about why the pond becomes almost invisible in late summer. Along the northside of the pond, in shallow water near the switchgrass colonies, was a large colony of the semi-woody swamp loosestrife which is often a biologic indicator for transition of ponds to marshland.

The productivity of Blue Heron Pond is evidently incredibly high. One sample of a square yard of pondweeds (mostly mermaid weed), taken in shallows 6 to 12 inches deep had a wrung-out wet-weight of 11¼ pounds! The total tonnage for the whole pond must be enormous, and really signals that this pond is rapidly moving from a eutrophic to a dystrophic or dying condition.

As for animal life, no fish were seen but numerous bullfrogs were seen

and heard. There were the usual great numbers and considerable variety of dragonflies, damselflies, and darners flying about. At various times, birds seen included egrets, mallards, black ducks, red-winged blackbirds, pheasants, catbirds, mockingbirds, and brown thrashers. There was evidence tracks, scat, or sightings of gray squirrels, raccoon, opossums, and cottontail rabbits. Mosquitoes were plentiful.

Although the old, closed-off road which runs east-west just to the north of the bluffs is heavily littered with abandoned cars and other solid refuse, the entire tract is still quite pleasant to be in during any season, since no houses can be seen and a sense of being at one with nature can be attained here. The entire area is well worth preserving as a nature area for present and future generations of Staten Islanders.

Microorganisms of the benthos and periphyton of the ponds in this study were identified by Mr. Edwin E. Newman of Brooklyn. See Appendix.

Water chemistry values obtained in May (1976) were recorded as follows: Dissolved Oxygen (DO) 8 mg./l.; CO_2 4 mg./l.; Chloride 110 mg./l.; Fe 3.5 mg./l.; total hardness 60 mg./l.; alkalinity 10 mg./l.; H_2S 0.5 mg./l.; No_3 0; PO_4 0.38 mg./l.; and pH -- 6.2.

ARDEN HEIGHTS POND

This isolated pond in the Eltingville section of Staten Island might have been a swamp before achieving its present dubious status as a pond, which may have been due to reduction or closing-up of its outlets. In any event, it is located deep in the woods of Arden Heights at the base of some good-sized hills. These hills seem to have numerous seepage outlets from underground, and water finds its way to this pond. At one time, evidently, this pond had an outlet called "Moore's Brook" that ran to the Fresh Kills Estuary. However, at present New York City's Sanitary Land Fill operation seems to have cut off Moore's Brook, which thus no longer acts as an effective drain, causing water in the pond area to stagnate and become eutrophic. A further probable contributor to the to the terminal hydrosere succession that is going on here is the presence on high ground on the hills around the pond of a number of private homes, in addition to St. Michael's Home (Editor's Note: Which has been closed since this was written). It seems probable that some sewage and nutrient-enriched washwater is entering the soil from these buildings and might be reaching the pond. Today the pond is in the swamp shrub stage of its hydrosere, and is on the verge of becoming a swamp woods. Actually it could provide a last stage in the hydrosere following Luten Pond, described earlier, except that Arden Height Pond seems to be located on ground moraine rather than on terminal

moraine. Dominant tall trees seen around the pond are sweetgums and white oaks, but less numbers of red oaks, pignut hickories, and sourgum are also in the canopy. Infrequently, at canopy level, clusters of swamp chestnut oak can be seen next to thickets of gray birch or groves of large-toothed aspen. The rather sparse second story consists of sweetgums, white oaks, red oaks, red maples, sourgums, and highbush blueberries. Ground cover was observed to be light, being mainly only leaf-litter. But common catbrier was quite plentiful, and a few scattered seedlings or young plants of pignut hickory, white oak, sweetgum, white ash, red maple, and gray birch could be seen. One infrequent shrub identified was alderleaf buckthorn. In very shady areas, other shrubs that were glimpsed were arrowwood, and saplings of pin oak and mockernut hickory trees.

The pond was seen to be densely occupied for about half of its area by tall reed grass, while several hundred buttonbushes took up another one-third of its surface. Arrow arum grows in quantity in shallow water wherever there is a little open space, and the same can be said for false loosestrife and some numerous clots of a green alga.

Sedges such as *Carex hyalinolepis* Steud, and *Carex flava* L. were noticed mixed with mosses and grasses along the sandy shore. Some mallard ducks were scared up from their concealment among stalks of the tall reed grass.

Benthos, periphyton, and plankton identified from water of this pond is as follows: Benthos. Macrofauna: Statoblasts in great numbers of *Pectinatella magnifica*. Microfauna: *Stentor roeseli, Amoeba proteus, Arcella vulgaris,* and *Keratella quadrata*. Algae: *Peranema trichophorum* and species of *Pinnularia, Navicula, Synedra,* and *Gomphonema*.

Periphyton. Microfauna: *Arcella vulgaris, Amoeba proteus, Didinium nasutum, Paramecium caudatum, Paramecium aurelia, Stylonuchia putrina,* and *Actinophyrys* sp. Algae: *Euglena elastica, Astasia dangeardi, Astasia Trichophora, Chlamydomonas anoulosa, Chlamydomonas pulviculus, Spirogyra* sp., *Closterium monoliferum, Scenedesmus quadicauda, Ankistrodesmus falcatus, Chlorella vulgaris,* and species of *Pinnularia, Navicula, Fragilaria,* and *Diatoma*. Plankton. Microfauna: *Arcella vulgaris, Amoeba proteus, Paramecium caudatum, Didinium nasutum,* and *Centropyxis aculeata*. Algae: *Perenema trichophorum. Gonium sociale, Spirogyra porticalis, Chlorella vulgaris, Cladophora glomerata, Scenedesmus quadricauda, Pediastrum boryanum, Tabellaria fenestrata,* and species of *Pinnularia, Cyclotella,* and *Navicula*.

INDEX of Names of Vascular Plants, arranged alphabetically by families.

ACERACEAE. *Acer rubrum* L. Swamp, or Red Maple
A. saccharinum L. Silver Maple
ANACARDIACEAE. *Rhus copallina* L. Dwarf Sumac
R. radicans L. Poison-ivy
APOCYNACEAE. *Apocynum cannibum* L. Indian Hemp
ARACEAE. *Peltandra virginica* (L.) Kunth. Arrow-arum, or Tuckahoe
ASCLEPIADACEAE. *Asclepias syriaca* L. Common Milkweed
BALSAMINACEAE. *Impatiens capensis* Meerb. Balsam
Rhamnus alnifolia L'Her. Alder-leaved Buckthorn
BETULACEAE. *Betula lenta* L. Black Birch
B. populifolia Marsh. Gray Birch
Carpinus caroliniana Walt. Ironwood
BRASSICACEAE. *Barbarea vulgaris* R. Br. Yellow Rocket
CALLITRICHACEAE. *Callitriche heterophylla* Pursh. Water Starwort
CAPRIFOLIACEAE. *Lonicera japonica* Thunb. Japanese Honeysuckle
Sambucus canadensis L. Common Elder
Viburnum dentatum L. Arrowwood
V. prunifolium L. Black Haw
CELASTRACEAE. *Celastrus scandens* L. American Bittersweet Vine
COMMELINACEAE. *Commelina communis* L. Dayflower
COMPOSITAE. *Achillea millifolium* L. Yarrow.
Ambrosia artemisifolia L. Common Ragweed
A. trifida L. Great Ragweed
Arctium Lappa L. Great Burdock
Aster novae-angliae L. New England Aster
Cirsium arvense L. Canada Thistle
Iva frutescens L. Marsh Elder
Solidago altissima L. Tall Goldenrod
S. rugosa Mill. Wrinkled Goldenrod
Xanthium strumarium L. Cocklebur
CORNACEAE. *Cornus amomum* Mill. Silky Dogwood
C. florida L. Flowering Dogwood
C. stolonifera Michx. Red Osier Dogwood
Nyssa sylvatica Marsh. Sourgum, or Black Gum
CYPERACEAE. *Carex flava* L. Sedge
C. hyalinolepis Steud. Sedge
C. lurida Wahl. Sallow Sedge
C. stipata Muhl. Sedge
C. straminea Willd. Sedge
Cyperus strigosus L. Umbrella Sedge
Eleocharis obtusa (Willd.) Schult. Spike-rush

DIOSCOREACEAE. *Dioscorea villosa* L. Wild Yam
EQUISETACEAE. *Equisetum litorale* Kuhl. Horsetail
ERICACEAE. *Leucothoe racemosa* (L.) Gray Swamp Leucothoe
Rhododendron nudiflorum (L.) Torr. Pinxter Flower
R. viscosum (L.) Torr. Swamp Azalea
Vaccineum angustifolium Ait. Early Low Blueberry
V. corymbosum L. Highbush Blueberry
V. atrococcum (Gray) Heller Black Highbush Blueberry
FAGACEAE. *Fagus grandifolia* Ehrh. Beech
Quercus alba L. White Oak
Q. coccinea Muenchh. Scarlet Oak
Q. michauxii Nutt. Swamp Chestnut Oak
Q. palustris Muenchh. Pin Oak
Q. phellos L. Willow Oak
Q. prinus L. Chestnut Oak
Q. rubra L. Red Oak
Q. velutina Lam. Black Oak
HALORAGIDACEAE. *Proserpinaca palustris* L. Mermaid Weed
HAMAMELIDACEAE. *Liquidambar styraciflua* L. Sweetgum
HYPERICACEAE. *Hypericum virginicum* L. St. John's-Wort
JUGLANDACEAE. *Carya glabra* (Mill.) Sweet Pignut Hickory
C. tomentosa Mockernut Hickory
JUNCACEAE. *Juncus canadensis* J. Gay Rush
J. Gerardi Loisel. Black Grass
J. subcaudatus (Engelm.) Cov. & Blacke. Bog-rush
LAURACEAE. *Lindera benzoin* (L.) Blume Spicebush
Sassafras albidum (Nutt.) Nees. Sassafras
LEGUMINOSAE. *Amorpha fruticosa* L. Common Indigobush
Robinia Pseudo-Acacia L. Black Locust
LEMNACEAE. *Lemna minor* L. Lesser Duckweed
L. perusilla Torr. Duckweed
Wolffia columbiana Karst. Watermeal
LENTIBULARIACEAE. *Utricularia biflora* Lam. Bladderwort
U. fibrosa Walt. Bladderwort
U. gibba L. Bladderwort
LILIACEAE. *Hemerocallis fulva* L. Day Lily
Smilax rotundifolia L. Common Greenbrier, or Catbrier.
LOBELIACEAE. *Lobelia cardinalis* L. Cardinal Flower
LYTHRACEAE. *Decodon verticillatus* (L.) Ell. Swamp Loosestrife
MAGNOLIACEAE. *Liriodendron tulipfera* L. Tulip Tree
MALVACEAE. *Hibiscus palustris* L. Rose Mallow, Marsh Hibiscus
MENTHACEAE. *Lycopus rubellus* Moench. Water Horehound
MORACEAE. *Morus alba* L. White Mulberry
NAJADACEAE. *Nuphar variegatum* Engelm. Yellow Water Lily
Nymphaea odorata Ait. Fragrant Water Lily
ONAGRACEAE. *Ludwigia palustris* (L.) Ell. False Loosestrife
Oenothera biennis L. Evening Primrose
PHYTOLACCACEAE. *Phytolacca americana* L. Pokeweed
POACEAE. *Cenchrus tribuloides* L. Sandbur Grass
Diplachne maritima Bickn. Salt-meadow Grass
Distichlis spicata (L.) Green Salt Grass
Phragmites communis L. Tall Reed Grass
Spartina pectinata Link. Slough Grass, Cordgrass

POLYGONACEAE. *Polygonum coccineum* Muhl. Water Smartweed
P. cuspidatum Sieb. & Zucc. Japanese Knotweed
P. hydropiperoides Michx. Mild Water Pepper
P. punctatum Ell. Dotted Smartweed
Rumex acetosella L. Common Sorrel
R. obtusifolius L. Bitter Dock
RANUNCULACEAE. *Clematis dioscoreifolia* Levl. & Van. Sweet Autumn Clematis
Ranunculus trichophyllus Chaix. Water Crowfoot
ROSACEAE. *Amelanchier canadenis* (L.) Medic. Juneberry, or Shad-bush
Aronia arbutifolia (L.) Ell. Red Chokeberry
Prunus serotina Ehrh. Black Cherry
Rubus argutus Link. Tall; Blackberry
Rubus flagellaris Willd. Northern Dewberry
Spiraea latifolia (Ait.) Borkh. Broadleaf Meadowsweet
RUBIACEAE. *Cephalanthus occidentalis* L. Buttonbush
SALICACEAE. *Populus grandidentata* Michx. Large-toothed Aspen
Salix caroliniana Michx. Ward Willow
S. lucida Muhl. Shining Willow
S. nigra Marsh. Black Willow
SCROPHULARIACEAE. *Linaria vulgaris* Hill. Butter-and-eggs.
Verbascum thapsus L. Mullein
SIMAROUBACEAE. Ailanthus altissima (Mill.) Swingle Tree-of-heaven
TILIACEAE. *Tilia americana* L. American Basswood
TYPHACEAE. *Typha latifolia* L. Common Cattail
ULMACEAE. *Celtis occidentalis* L. Hackberry
Ulmus rubra Muhl. Slippery Elm
UMBELLIFERAE. *Daucus carota* L. Wild Carrot
Pastinaca sativa L. Parsnip
URTICACEAE. *Urtica dioca* L. Stinging Nettle
VITACEAE. *Parthenocissus quinquefolia* (L.) Planch. Virginia Creeper

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Appendix: Blue Heron Pond

April 27, 1976 AQ 30 Benthos. pH 6
Protozoa: *Arcella discoides. Perenema trichophorum. Astasia trichophor. Amoeba limax. Amoeba hetrophrys. Arcella vulgaris. Centropyxis aculeata. Difflugia corona. Tabellaria fenestrata. Pinnularia biceps. Synedra parasitica.*
Sand and clay particles (dense)
Abundant botanical debris (non-identifiable; decomposed)
Abundant fungi—*Mitrula paludsa?*
Leptothrix
Spirella
Oil film upon surface after 48 hours. 72°F. in jar.

April 30, 1976 (Periphyton) pH. 7 Color: dark yellow (urine)
Arcella vulgaris, Paramecium caudatum (many) 5-10 L.P.F. (80 X)
Paramecium aurelia (3-4 in low powered field) 80 X
Difflugia urceolata
Hydra americana, "4" (sighted with 6X loupe upon sand surface)
Spicules (sponge)
Gemmule (*Spongilla lacustris*)?
Caddis fly cases
Tubifex: *Pinnularia major. P. torta. Navicula radiosa. Asterionella formosa.*
Fragillaria capucina.
Ankistrodesmus facatus.
Spirogyra (sections only making positive identification impossible)
Draparnaldia glomerata
Euglena viridis
Tetraedron regulare, Netrium digitus.
Navicula. Pinnularia. Eunotia

April 30, 1976 AQ 304 Periphyton pH 6.8 (H. Behm)
Abundant botanical debris and plant life—none microscopic. Brown Hydra on above.
Arcella discoides
Difflugia coronona
Asterionella formosa
Navicula radiosa
Spicules (sponges)
Very clean collection; not much microscopic.

April 27, 1976 AQ 304 Periphyton pH 7
Arcella discoides. Amoeba limax. A. hetrophrys. Difflugia urceolata.
Euglena viridis (very many—30-40 L.P.F. 80X)
Netrium digitus.
Spicules (sponge)
Gemmule
Pinnularia major, Eunotia; *Synedra pulchella; Eunotia flexuosa.*
Spirella; Coccus; Bacillus

May 10, 1976. AQ 300 (Benthos) pH 6.4. AQ 305
Protozoa
Astasia trichophor; Arcella vulans; Difflugia corona; Arcella vulgaris
Pinnularia biceps; Synedra parasitica.
Abundant botanical debris.
Leptothrix. Spirella, Oil film on specimen

April 30, 1976 AQ 312 pH 6.8 Brown-yellow color. Oil scum
Cyclops
Caddis fly cases. Live Caddis Fly. *Leptocella albida.*
Dryopids. *Hydrometra martini. Daphnia pulex. Monostyla lunaris. Arcella vulgaris. Paramecium aureila. Difflugia urceolata. Euglena viridis.*
Netrium digitus. Statoblasts *(Pectinatella magnifica).* Tubifex.
Pinnularia flexuosa, P. brebissonii.
Meridian circulare. Fragilaria capucina. Tabillaria fenestrata.

GEOLOGY & WATER QUALITY

by **Hans Behm, M.S.**

TURTLE POND

This little gem of a pond is located 330 feet north of the intersection of Kingdom Avenue and Jansen Street. Its straight northeastern margin is delineated by the remnants of a sidewalk of Stecher Street, now largely obscured by vegetation. The pond is not shown on the 1913 topographic map. It too owes its origin to the damming effect brought about by the construction of the roads in the 1920s.

Turtle Pond is about 240 feet long and approximately 115 feet wide at its broadest end. The depth averaged one to two feet. The total surface area is a little less than one-half acre. The elevation is 30 feet above sea level. On May 29, 1975 the water temperature was 83°F. near the shore.

Turtle Pond is covered with a dense growth of water lilies during the warmer months and they are usually in full bloom. The display of flowers was most beautiful during the 1975 summer season, when much rain kept the pond filled to its full capacity. While out on a boat, I heard one of the many broods of the periodical cicada in late May and early June. I observed many bull-frogs and the tadpoles, which measured about an inch or more across. The water lilies afforded the frogs an excellent place to hide in ambush to carry out their predatory habits.

The water was mostly clear to the bottom, hence no secchi disk readings were necessary. A thick mat of leaves, coming from many of the stately trees that line the shore, forms a layer along the margin of the pond, producing an excellent ecological niche for the Testacida. Closer examination revealed that the bottom muds were undergoing strong reducing conditions and a marked odor of H_2S was present. Some sphagnum moss grows along the shore in the shallow water, an indication of the acidity of this pond. The thick tangle of water lilies and their roots made it difficult to take bottom samples with a dredge; instead, I used a soil sampler. The outflow channel is located midway along the northeast border of the pond.

Turtle Pond is a very attractive fresh-water body, set amidst a lush and green sylvan setting. Some refuse has found its way into the pond; however, it escaped serious environmental damage.

Geologic Setting. Turtle Pond sits on typical glacial till of the terminal moraine. The slopes immediately around the pond are gentle. Towards the southwest, south, and the southeast, the terrain becomes steeper and may be as much as 20°. This terrain is marked by a network of larger erosional gullies that mark the path of water in its downslope movements toward the pond. Though the tree growth is considerable, the surface beneath is exposed and subject to erosion. A few glacial erratics are scattered over the landscape.

The stratigraphic sequence beneath the pond is as follows: glacial till of the terminal moraine; thin brown or gray layers of clay; and, a thin layer of mud and organics.

Description of Sediments. The glacial till includes reddish-brown constituents of the Upper Triassic Newark Group, usually shale and sandstone. The processes samples also revealed many varieties of gneiss, granite, quartzite, and conglomerate. The size ranges from 1/256 mm to more than 256 mm, or boulder. The particles are angular, subangular, subrounded, and rounded, including some that are either equidimensional, or elongate. Glacial striae are common on pebbles and on boulders.

Microscopic Description of Faunal and Floral Constituents. The bottom samples revealed only a few organic parts; periphyton, collected within the thick leaf litter in the shallow portion near the shore, revealed beautifully preserved tests of the Testacida; many live specimens were present. *Difflugia oblonga* Ehrenberg showed a multitude of spines at the posterior end of the test and many contained zoochlorellae (Leidy). A few tests were distinctly decorated with green diatoms. *Arcella vulgaris* Ehrenberg, another common testacean, is also present. In addition, the samples contained numerous insect parts, seeds, and charred plant debris.

Comments on the Weather. May 29, 1975 was a clear day with a few wisps of cirrus clouds. The wind direction was from the southwest and its intensity was 0 to 5 knots. No rain had been recorded for the last 24 hours.

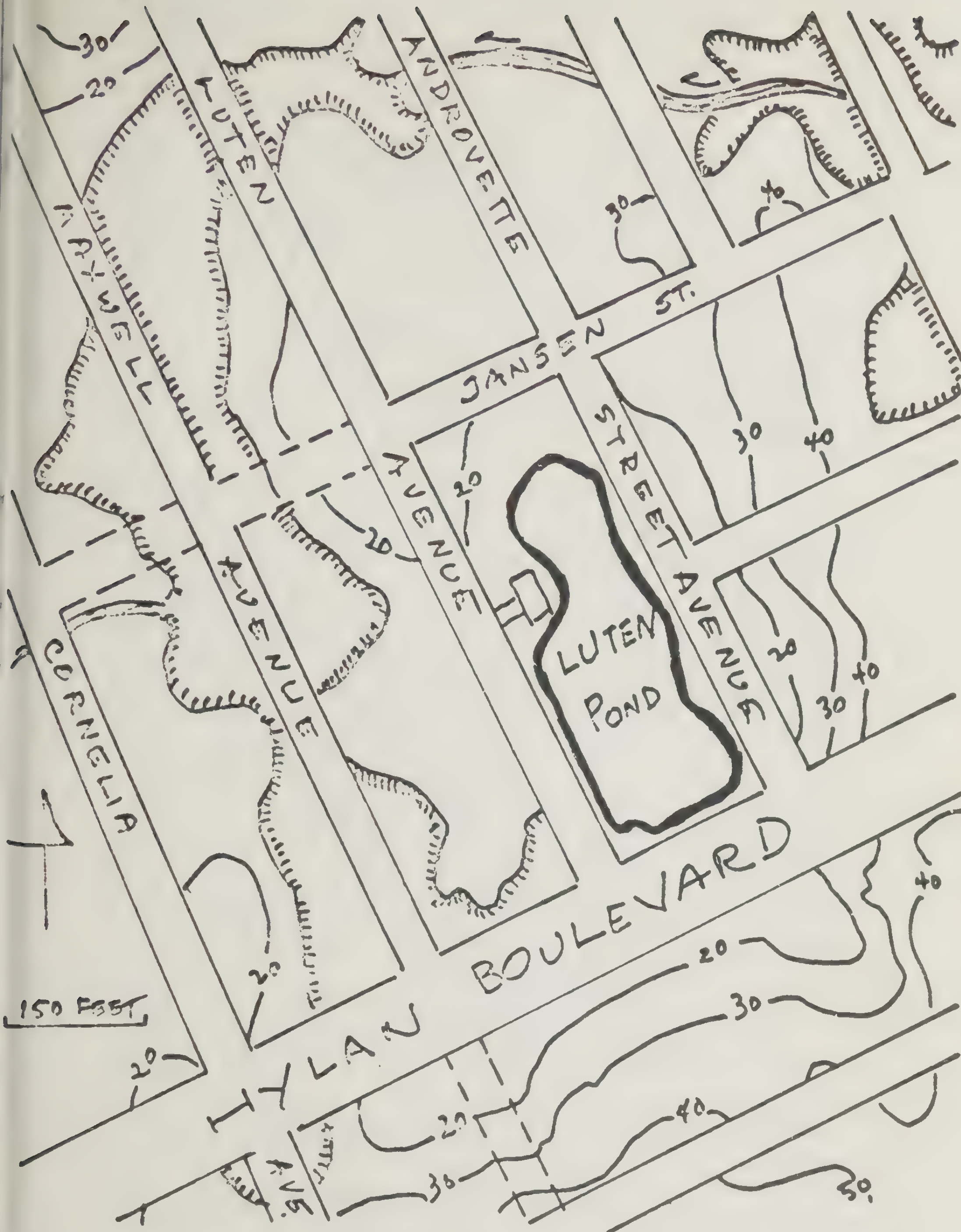
LUTEN POND

Luten Pond, artificially created, is located northeast of Luten Avenue, southeast of Jansen Street, Southwest of Androvette Avenue and north of the intersection of Luten Avenue and Hylan Boulevard. The pond is 530 feet long and about 190 feet wide. The overall surface area is approximately 85,500 square feet, or 1.96 acres. The area that the pond now occupies is shown as a swamp on the 1913 topographic map. In fact, this swamp extended beyond the area now occupied by Luten Avenue and across what is now Hylan Boulevard. Luten Pond apparently has been produced by the construction of these two roads, which blocked the drainage and now serve as artificial dams. The outflow pipe for Luten Pond is located at its southwestern side, continues underneath Luten Avenue and empties into the swampy area beyond, which many years ago was part of the more extensive swamp area. The pond is about 15 feet above sea level. The inherent color, most of the time, was a greenish-brown.

During field operations (summer of 1975), it was difficult to get good bottom samples with a dredge because a dense mat of swamp weed and algae covers most of the bottom. The great number of dead trees, coupled with the many fallen branches, made it difficult to move about with the boat, or even collect plankton samples; this situation being true of the northwest corner of the pond. Some of the vegetation produced "floating islands" in places. While wading into the pond, the disturbance of the bottom muds resulted in the release of considerable amounts of methane gas (CO_4), or marsh gas. This gas, which is odorless and colorless, produces a potentially explosive mixture when in contact with air. The gas is produced by the rich deposits of rotting vegetation near the bottom and in the organic muds. According to my colleague, Al Hendricks, there were no cat-tails, reeds or sedges in this pond. Neither did we find any lily patches.

There were numerous bull-frogs and their larval stages, or tadpoles. While out in the boat, I observed a nest or two of the red-winged blackbirds perched atop some of the emergent vegetation. When the bottom was disturbed, either with an oar or a dredge, black clouds of finely divided organic mud were produced. Because of excessive eutrophication, this pond is on its way to becoming extinct.

Geological Setting. Luten Pond is located on top of typical glacial till of the terminal moraine. A core sample obtained by driving the auger


LUTEN
ANDROVETTE
JANSEN ST.
AVENUE
STREET
AVENUE
LUTEN
POND
CORNELIA
AVENUE
HYLAN BOULEVARD
AVE.
150 FEET
20
30
40
50

through the vegetation and the plant mat, revealed a rather clayey portion, which upon closer examination revealed the familiar constituents of glacial till.

The pond is typically delineated by Luten Avenue and Hylan Boulevard which serve as artificial barriers along its southwestern and southeastern margins. Along the northwestern, northern and, northeastern borders, a relatively dense stand of trees comes right up to the edge of the pond. Undoubtedly, the great abundance of rotting vegetation near the pond's bottom is due to the fact that it was formerly a fresh-water swamp.

No significant sedimentation patterns were observed.

The stratigraphic sequence is as follows: glacial till of the terminal moraine, composed of classical Wisconsin drift, very muddy and oozy organic black muds with much decaying plant debris and aquatic vegetation.

Microscopic Description of Sediments. The washed residues consisted of a fine to medium sand with much clay. The clay, which was brown and gave the sample the typical color, is of glacial origin. The processed auger samples revealed a good percentage of clear and transparent, angular to subangular quartz, with some subrounded grains; also, milky and white, partially cloudy white quartz grains, angular to subangular, with some subrounded grains; some pinkish and reddish semi-transparent quartz, with a few grains almost opaque. The quartziferous fraction also contained a few well-rounded frosty grains. Some jasper is also present. In addition, there is an abundance of red shales of the Newark Group, largely angular, subangular and subrounded, with a few elongate grains; white and pink feldspar, amphibole, some white mica, some magnetite, fragments of granite and gneiss, some pink-colored; fine-grained grayish sandstone and siltstone, and possibly some basalt. There were a few fragments of concrete, attributable to the construction of the roads delimiting the pond.

Microscopic Description of Faunal and Floral Constituents. The periphyton samples revealed a great abundance of desmids, some green hydra, rotifera, gastropoda and many seeds. The testacea were abundantly represented by *Difflugia corona.* The ostracoda were represented by the rather ubiquitous *Cypridopsis vidua.* Small diatoms were also present.

Comments on the Weather. May 28, 1975 was a clear day with a few cirrus clouds adorning the azure sky. The wind velocity was 0 to 5 knots and the visibility excellent, with a low relative humidity.

SPRING POND

Spring Pond is located between Poillon and Philips Avenues, northwest of Shirley Street and 400 feet north-northwest of the intersection of Hylan Boulevard and Philips Avenue. The 1913 topographic map shows that there was a fresh-water swamp at the site of Spring Pond. Local residents informed us that this pond was not present more than a decade ago. It was our good fortune to find the "spring" that feeds this fresh-water body. Each time we visited the pond we checked the "spring" and noted that it was always flowing at the same rate. We finally came to the conclusion that the "spring" is nothing more than a broken water main that runs marginally beneath the pond along the proposed construction of Philips Avenue. Supporting this contention is the presence of a DWS steel box and a fire hydrant just a few feet away from the pond. Supporting the "broken main" hypothesis is a chemical analysis of water taken directly from the "spring," which revealed 0.13 mg/1 of chlorine.

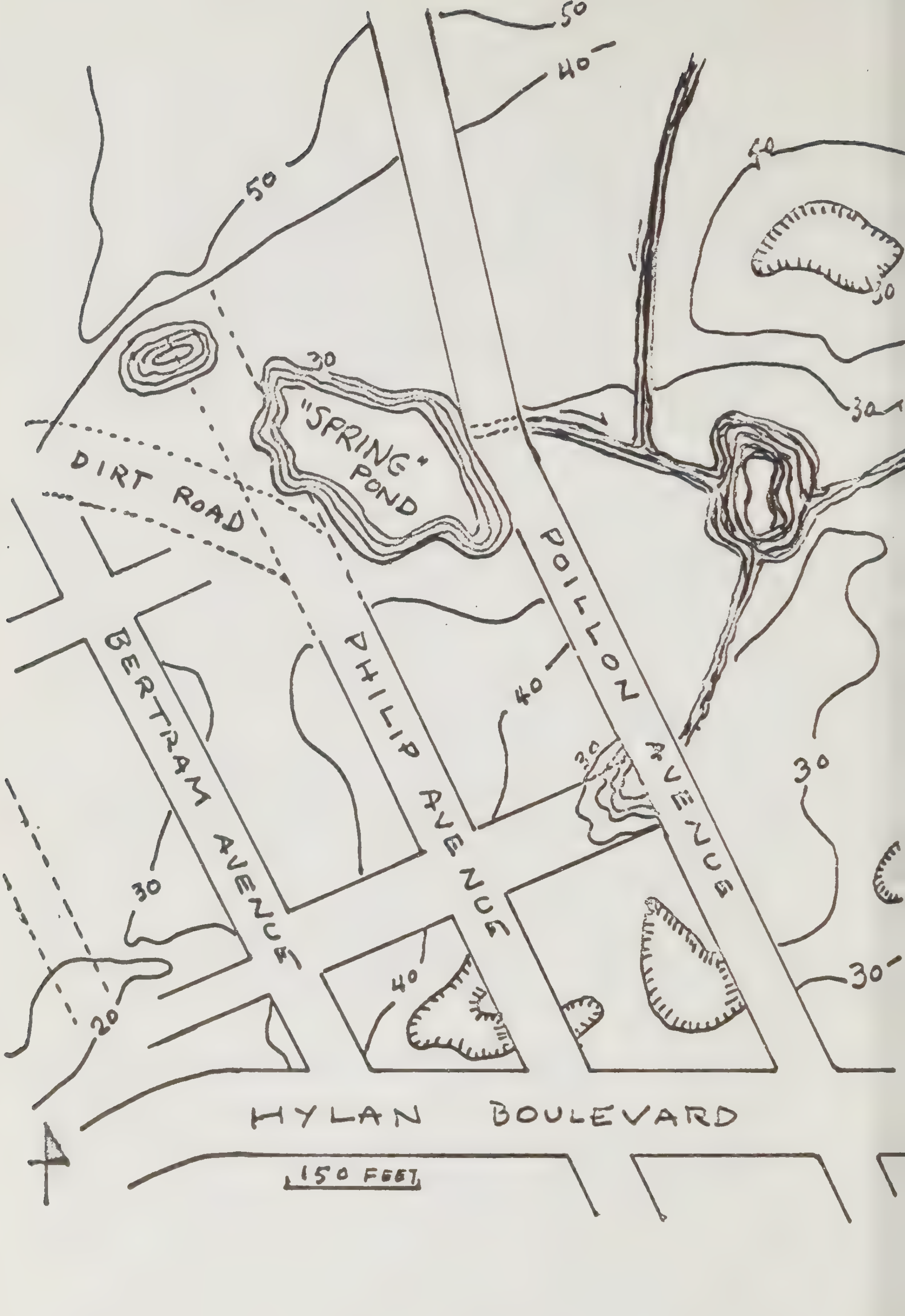
Spring Pond is about 420 feet long and about 225 feet wide. The surface area is about 1½ acres, but is subject to variation. The depth averaged 5 to 6 feet in the central portion, taken when the pond's waters were above normal level, due to the abundant rainfall in the summer of 1975. Under normal conditions, the depth averages 3 to 4 feet. The pond is about 30 feet above sea level.

The outflow pipe runs beneath and across Poillon Avenue and empties into a brook that winds its way about 700 feet into another brook that serves as an outflow for Blue Heron Pond. This kidney-shaped pond is located in a depression in a wild and thickly vegetated area between Lipsett and Poillon Avenues.

Many trees once stood in the swamp now occupied by Spring Pond. When the pond was created, the trees simply drowned. Several species of bracket fungi (Genus *Polyporus*), festoon the rotting and the toppled stems and fallen branches of the dead trees. The color of the water is usually dark green.

Geologic Setting. Spring Pond is located on former swamp deposits, which rest on glacial till. The pond is surrounded by glacial till banks, which are conspicuous along the northern periphery. Here are the steepest slopes, about 25 to 45°, which diminish gradually as you walk counterclockwise to the western portion, where the slope averages from 1 to 5°. Along the border of the dirt road that connects to Philips Avenue the slope averages 5 to 10°. Most of the sloping surface is highly irregular. Contributing to the more gentle slopes near the pond are deposits that were brought here from the nearby glacial banks.

The unconsolidated sediments that surround this pond are typical glacial till, composed of variously-shaped and broken red shales and


"SPRING" POND
DIRT ROAD
BERTRAM AVENUE
PHILIP AVENUE
POILLON AVENUE
HYLAN BOULEVARD
150 FEET
50
40
30
20

sandstones of the Upper Triassic Newark Series; yellowish and white, rounded and subrounded quartz pebbles; and, granite, gneiss, basalt, conglomerate and quartzite. The size of the constituent particles ranges from less than 1/256 mm to more than 256 mm or boulder.

Microscopic Description of Sediments. Much clear, transparent and translucent subangular quartz is present. The samples also contain milky white subangular quartz, rose-colored quartz, ferruginous quartz, fragments of quartzite, red shale and sandstone of the Newark Series, largely angular to subangular; and, a variety of genisses and granites.

Microscopic Description of Faunal and Floral Constituents. The Testacida include *Difflugia oblonga* Ehrenberg and *Difflugia corona* Wallich, the ostracode *Cypridopsis vidua* (O. F. Muller), and some gastropods. The processed samples also contain a great variety of seeds and chitinous insect parts, including much fly ash. The periphyton collected in October 1975, contained *Difflugia oblonga* Ehrenberg and *Difflugia corona* Wallich, including many gastropods, rotifera and desmids.

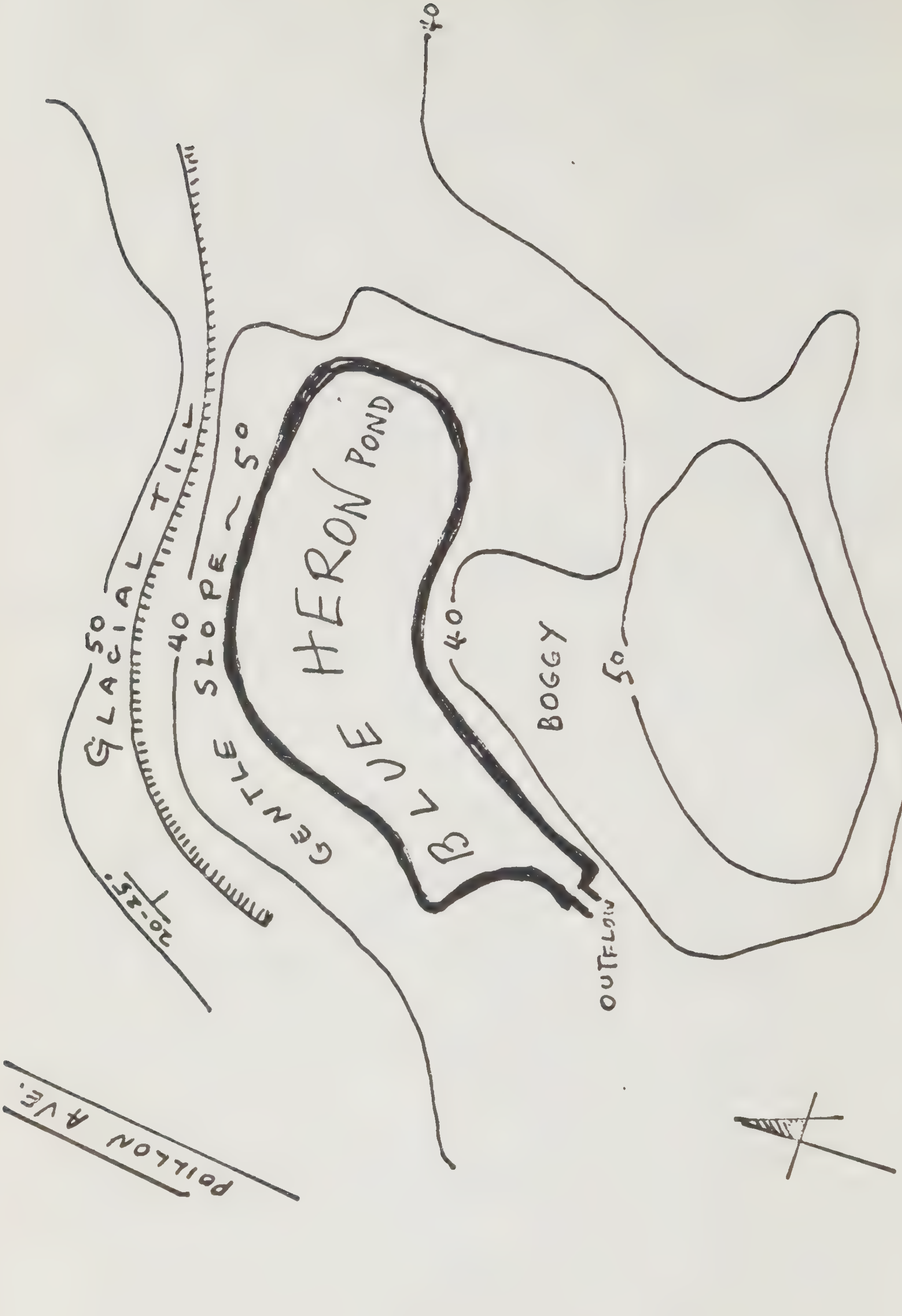
Comments on the Weather. May 21, 1975 was warm with a temperature of 88ºF and a low of 68ºF. Although the sky was mostly cloudy in the morning, there were many breaks in the cloud cover later in the day. The types of clouds present were *Altostratus, Altocumulus,* and *Cirrostratus.* The wind direction was from the southwest and the wind intensity about 1 to 5 knots. The visibility was good and the barometric pressure 29.91 inches. The relative humidity was 51%.

BLUE HERON POND

This pond is located between Lipsett and Poillon Avenues, northeast of "Spring" Pond. The pond is roughly bean-shaped. The average depth at time of operations in the Spring of 1976 ranged from one to two feet. The overall surface area is about one acre. The length is 320 feet and the width, 185 feet. Its elevation is 35 feet above sea level.

The periphery is rather heavily vegetated throughout the warmer season, the pond being almost completely covered with aquatic plants in the summer and fall.

The humus layer is generally thin (one to two inches), but pockets of humus occur in places that are much thicker. Much of the thin soil layer (the A-horizon), is destroyed by brush-fires in the spring and fall, particularly during dry weather. As is the case with many of the other ponds, the frequent brush fires contribute much charred plant debris through runoff into the pond, mixing with the bottom sediments. Partial bog conditions prevail and much tall grass surrounds this pond, particularly at the northern and the north-northeast perimeter and along the southern margin. The western and the eastern perimeters are


BLUE HERON POND
GLACIAL TILL
GENTLE SLOPE ~ 50
BOGGY
OUTFLOW
POILLON AVE.
20-25'
40
50

largely covered with trees. Some boggy ground extends about 100 feet away from the pond. In a few places, firm ground continues right up to the edge of the water, particularly along the northern perimeter. Thick leaf mats are caught amid the heavy aquatic vegetation along the margin, and there is much sphagnum moss covering the ground.

Geologic Setting. Blue Heron Pond is located in a depression in glacial till of the Harbor Hill terminal moraine. The highest terrain is present north of the pond, where the elevation reaches about 70 feet. This high point occurs about 600 feet north of the pond. The 50-foot contour points in the direction with the convex part of the elevated terrain, about 150 feet north of the pond. The slope varies considerably from place to place, with the steepest ground directly below the 50-foot contour, where it is 20 to 25°. The terrain immediately around the pond is reasonably level, with patches of bog-like deposits and a heavy growth of sphagnum moss and other aquatic vegetation. This minimizes erosion. The terrain south of the pond reveals a more or less circular area delineated by the 50-foot contour, about the size of the pond. The terrain west of the pond is rather gentle and is almost level up to Poillon Avenue. East of the pond the terrain is gentle, with the 40-foot contour delineating the area and beyond which the elevation remains fairly constant to Lipsett Avenue.

The stratigraphic sequence beneath the pond is: glacial till of the terminal moraine; swamp-like deposits and organic muds; oozy black organic muds and heavy aquatic plant growth.

Immediately beneath the thin layer of humus is typical Wisconsin till. In its wet condition, the till is a deep brown to reddish-brown, largely consisting of silt, sand, pebbles, with a varying amount of clay. Large boulders dot the landscape, many hidden from view by the heavy plant growth during the warm season. These boulders consist of a variety of gneisses, with occasional ones composed of quartzite and conglomerate.

Description of Sediments. Along one of the more conspicuous erosional gullies, the following rock constituents were observed: angular to subangular shale fragments of a reddish color, a few fragments of varying angularity consisting of reddish and pinkish sandstone, granitic gneisses, rounded and subangular, yellow subrounded quartz pebbles, brown ferruginous conglomerates, quartzites of various hues, largely subrounded, and many white opaque pebbles.

The sediments of the till are in disorderly array and consist of various compositions, sizes, and densities. The rate of weathering is highly differential with the argillaceous rocks being the most prone to physical and chemical decomposition.

Microscopic Description of Sediments. The coarser fraction of the washed residues consist of quartz fragments of various hues and angularities, though they tend to be less angular than the finer fraction. As a rule, the larger constituents are subrounded. The coarser fraction

also reveals much fragmented red shale and sandstone of Triassic Age. It is the fine clayey portion of these sediments that give the deposits that characteristic reddish-brown hue, due largely to the high percentage of ferrous iron.

Also present are various types of gneisses and granitic rocks in various stages of fragmentation. Quartzite and conglomerate are also present.

The finer residues reveal much fragmented clear quartz revealing different stages of angularity. Some quartz grains are milky white and opaque, some are reddish due to hematitic inclusions, and some are coated with a thin layer of ferrous iron oxide. Fragmented quartzite cannot be distinguished from fragmented quartz at very small sizes. Also present are occasional grains or magnetite, tourmaline, amphibole, pyroxene, pinkish and white feldspar. Some jasper-like fragments were also observed.

Man's contribution to the sediments includes fragmented coke, coal, aerial contaminants such as fly ash and much plastic.

Description of Microscopic Flora and Fauna. As this pond is heavily overgrown with vegetation, a rich and varied fauna of microscopic organisms is present. The Testacida include *Arcella vulgaris, Difflugia corona, D. oblonga,* and *Centropyxis aculeata.* Also present are many small diatoms. The rich and varied insect fauna contribute chitinous organic parts upon death which become incorporated into the bottom sediments. Most of the representative fauna associated with the periphyton and the benthos is included in the bottom muds of the pond and are in various stages of preservation. Only those organisms that have hard parts and/or skeletal structures contribute their share to the heavy organic bottom muds. The bottom muds release much H_2S gas due to the presence of anaerobic bacteria, producing strong reducing conditions.

ARDEN HEIGHTS POND

The pond is located south of the former St. Michael's Home for Children, west of Woodrow Road and south and southeast of Arden Avenue. Roughly, the pond is 750 feet long and 500 feet wide, and its surface area totals 4.3 acres. As the area is thickly vegetated and marshy, it was somewhat difficult to delineate its boundaries. It is indeed a marsh and is rather shallow.

An outflow proceeded from this pond northward to the Fresh Kills area, known as Keteltas' or Moore's Brook, but was cut off at a later date by the "sanitary" land fill in the 1950's. Because the pond is so eutrophic, it will cease to exist in another few years. The color of the water was a green brown. The average depth in the area examined was about one foot.

Geologic Setting. The "pond" is located upon glacial till. In the immediate vicinity, the slope is gentle, averaging 1-5°. There is little or no soil on top of the glacial deposits. The steeper slopes south of this pond are barren and have very little soil. The pond itself is choked with vegetation and hence, there are few open stretches of water.

The muds within the pond are thick and there is considerable release of H_2S gas.

The stratigraphic sequence is as follows: glacial till and possibly glacio-fluvial deposits; till clay layers with black pockets of organic materials; thick black clayey deposits; brownish and blackish organic deposits and recent vegetative cover.

Fungi. The following fungi were identified: *Amanita frostiana, A. vaginata, Russula emetica, Laccaria laccata, Cantharellus minor* and *Collybia platyphylla, Cantharellus cinnabarinus.* Analysis of the organic fraction at the microscopic level showed the samples to be *calis, Chlorella vulgaris, Cladophora glomerata, Scenedesmus quadricauda, Pediastrum boryanum, Tabellaria fenestrata,* and species of *Pinnularia, Cyclotella,* and *Navicula.*

NOTE: The water quality analyses of "Spring" and Blue Heron Ponds were performed with a DR-EL Direct Reading Engineer's Laboratory Series Hach Set. The tests were carried out under careful temperature control, as directed in the Methods Manual

"SPRING" POND

Test Number*	1	2	3	
DISSOLVED OXYGEN	11	11	10	mg/l
CARBON DIOXIDE	4	4	4	mg/l
ALKALINITY	30	20	20	mg/l
TOTAL HARDNESS	20	20	25	mg/l
CHLORIDE	10	20	15	mg/l
SODIUM CHLORIDE	16.5	32	24.7	mg/l
TOTAL IRON	0.8	1.7	.58	mg/l
COPPER	30	.18	.03	mg/l
NITRATE	0.2	1.10	1.76	mg/l
NITROGEN	--	.25	.4	mg/l
PHOSPHATE	0.6	.05	.02	mg/l
HYDROGEN SULFIDE	0	--	0	mg/l
CHLORINE	--	--	.02	mg/l
CHROMIUM	--	.02	.02	mg/l
SULFATE	--	--	10	mg/l
pH	6.5	7.3	6.7	units

**Test Descriptions: #1. May 1976. Analysts: Behm & Hendricks #2. 7/12/1977. Heavy thunderstorms on that day near pond (pH of rain=4.8 units). Analyst: Behm. #4. 9/15/1977 at 12:50 p.m. Air Temp: 67° F. Water Temp: 68° F. Soil pH near pond, about 2 feet from edge: 5.5 units. Analyst: Behm.*

BLUE HERON POND

Test Number*	1	2	3	
DISSOLVED OXYGEN	8	5	3	mg/1
CARBON DIOXIDE	4	8	4	mg/1
ALKALINITY	10	20	20	mg/1
TOTAL HARDNESS	60	20	20	mg/1
CHLORIDE	110	15	11.5	mg/1
SODIUM CHLORIDE	181.5	24	19	mg/1
TOTAL IRON	3.5	3.5	3.2	mg/1
COPPER	-	.15	.14	mg/1
NITROGEN	-	.2	.2	mg/1
NITRATE	0	.9	.9	mg/1
PHOSPHATE	.38	.11	.1	mg/1
HYDROGEN SULFIDE	.5	.01	-	mg/1
CHROMIUM	-	.03	.01	mg/1
CHLORINE	-	0	0	mg/1
SULFATE	-	-	14	mg/1
pH	6.2	6.15	6.2	units

Test Descriptions: #1. May 1976. Question: Why the high chloride content? See analyses carried out in 1977. 1976 was year with somewhat below normal precipitation. Analysts: endricks & Behm. #2. 9/8/1977. 10 a.m. Air Temp: 72° F. ater Temp: 69° F. Analyst: Behm. #3. 9/9/1977. 10:15 a.m. ir Temp: 70° F. Water Temp: 67° F. Analyst: Behm.

PROCEEDINGS

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Brood II of the 17-year Cicada on Staten Island: Timing and Distribution

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The coming of the 17-year cicada (*Magicicada*) is a more celebrated event on Staten Island than elsewhere largely due to the efforts of "one" William T. Davis. Following his death in 1945, his tradition of public education and record-keeping was carried on by his friends and colleagues at the Staten Island Institute of Arts and Sciences. This paper summarizes the distribution and timing of the 1979 emergence of Brood II of the periodical cicada on Staten Island and incorporates the Institute's records for 1894, 1911, 1928, 1945, and 1962. A comparison of these records will provide the most complete summary of variation in timing of *Magicicada* life history events yet available.

THE THREE SPECIES

There are three species of 17-year cicadas all of which are found on Staten Island: *Magicicada septendecim, M. cassini,* and *M. septendecula. M. septendecula* was not described until 1962 (Alexander and Moore, 1962) because of its similarity to *M. cassini.* Both of these are smaller than the more common *M. septendecim* and the courtship song of *cassini* is similar to the chorusing song of *septendecula.* The three species can be distinguished in the field. *M. septendecim* has orange abdominal sternites (with occasional black markings along the midline and anterior sternite borders), black tarsi, and an orange patch behind and below the eye. The smaller *M. cassini* has entirely black abdominal sternites, black tarsi, and no orange patch. *M. septendecula,* similar in size to *M. cassini,* has orange-striped abdominal sternites, orange tarsi and no orange patch. The chorusing song of each species is quite distinct (Alexander and Moore, 1962).

The three morphologically distinct species also differ in microhabitat preference. *M. cassini* prefers floodplain forests. The other two are typically found in the uplands where *septendecula* exhibits a strong preference for hickory trees (Lloyd and Dybas, 1966, Dybas and Lloyd, 1974). In disturbed situations these preferences tend to break down (Lloyd and White, 1976).

LIFE HISTORY

Periodical cicadas emerge earlier than most of their annual relatives: mid to late May, rather than July or August. Fifth instar nymphs emerge in the evenings over a week's time. The heaviest emergence is usually concentrated in one or two nights. The males begin to sing two days to a week after emergence depending on the population density (Rick Karban, personal communication). Mating takes place in the second or third week and is followed immediately by egg laying. Eggs are laid in slits in pencil-sized tree branches: an average of 24 eggs/nest (Marlatt, 1907). Excessive oviposition damage can result in the death of twigs and consequently little or no hatching (White, in prep.). The dead brown branch tips (called flags) stand out in contrast to the green leaves and can be used to map the distribution of the cicadas after the adults have died.

The adults live four to six weeks. The eggs hatch one and one-half to two months after they are laid and the millimeter-long larvae fall to the ground, crawl into cracks in the soil (Snodgrass, 1921), and begin to feed on the xylem fluid of tree rootlets (White and Sthrel, 1978).

BROODS

Periodical cicadas are found only east of the Great Plains in the United States. The year of adult emergence differs from place to place. Each year– class is called a brood. The broods are numbered sequentially: Brood I last emerged in 1978, Brood II this spring (1979), Brood III next year, etc. Broods which overlap geographically are separated in time by at least four years while adjacent broods are often separated by only a year (Alexander and Moore, 1962; Lloyd and Dybas, 1966). Most broods contain all three species. At present there are thirteen broods of 17-year cicadas. In general, most broods have geographic and evolutionary continuity (Simon, 1979a), although disjunct populations are known to exist (Simon, Karban and Lloyd, in preparation).

1979 FIELD SEASON

Brood II of the 17-year cicadas emerged this spring in northern Georgia (Hudgins, 1979; Anonymous, 1979), North Carolina, Virginia, Pennsylvania, Maryland, New Jersey, New York, and Connecticut (Figure 1). A field assistant and I traveled throughout the range collecting specimens (for morphological and allozymic studies), and mapping the distribution. Special attention was paid to Staten Island because records on timing and distribution have been kept every generation since 1894 (Davis, 1911; Koestner, 1945; Cleaves, 1946; Abbott, 1949).

We made several trips around Staten Island during the field season and two flagging surveys after the adults had died. In addition, a re-

quest for information was printed in two semi-popular magazines (Simon, 1979b; 1979c), and records were solicited by Joseph F. Burke of the Staten Island Museum.

Distributional information is summarized in Figure 2. The stippled portion represents the edges of the distribution as determined from the flagging surveys. There were several areas noted where oviposition was not heavy enough to cause damage. These areas are indicated by hollow stars. Other areas in the southeast may have had cicadas but no records yet exist. Other symbols are discussed later in the text.

Although the map of Figure 2 shows the cicadas' distribution as essentially continuous, their populations were, as they typically are, patchy. The patchiness increases near the edges of the stippled portion. The smallest disjunct stippled dot (Wheeler Ave.) is an example of this situation. Cicadas were very heavy on this block and light or absent on surrounding blocks. No explanation for this phenomenon has been forthcoming but it has been documented on a microspatial scale as well (Simon, Karban, and Lloyd, in prep.).

CHANGES IN DISTRIBUTION

Because travel was more difficult in 1894, 1922, and 1928, Davis made no surveys of the entire island's cicada populations. He made most of his journeys on foot. Specific locations noted by Davis are listed in the appendix.

The most significant change in the distribution of the periodical cicadas on Staten Island is one of which Davis noticed the beginnings:

> "While the cicadas were generally distributed over the wooded portions of Staten Island except the small so-called pine barren areas, yet, as has been observed in previous years, they were much more numerous in some places than in others. In 1877 there were a great many seventeen-year cicadas in the garden at New Brighton surrounding the house where I lived. Though the same fruit trees are standing and the conditions as regards vegetation have not particularly changed, yet I failed to find any of the cicadas in 1911. Probably they have been exterminated by the house-sparrow." (In Abbott, 1949, p. 165)

Thus, by 1911, periodical cicadas were beginning to disappear from the north end of the island. Joseph F. Burke heard two *Magicicada* singing in Davis' old neighborhood in 1962 but saw none.

In West New Brighton, cicadas were plentiful in 1928, 1945, and 1962, but in 1979 only a few individuals were seen and no damage was apparent in the trees. Only a few thousand individuals were noted to emerge in the vicinity of the Staten Island Zoo where extremely heavy populations had been present in 1962. As a result, singing was noted to begin late in the season and end earlier than other places and no oviposition damage was seen (E. Oppenheimer, personal communication). J. Rawsen of Pelton Ave., West New Brighton, saw only three live adults and 40 to 50 exit holes this year, whereas Koestner (1946)

Fig. 1
Map of the distribution of Brood II (modified from Marlatt, 1907).

reported heavy populations on Pelton Ave. in 1945. On nearby Valencia Ave., Dr. R.J. O'Connor reported that periodical cicadas were abundant in 1962 and absent this year.

The entire north and east end of the island seems to have experienced a decline. H. Behm, formerly of Stapleton, reports that the cicadas were heavy all along Howard Ave. in 1962. This year, there were no oviposition scars to be seen along Howard Avenue except at the extreme southern end near Wagner College and Sunnyside. Similarly, cicadas were reported as heavy at 960 Fingerboard Road in 1928 and 1945, yet no oviposition damage was seen in 1979 at the same address.

The Clove Valley was one of Davis' favorite spots for observing 17-year cicadas. He described the emergence as heavy in 1928 at Britton's Upper Pond. This year there was considerable oviposition damage to the trees at the extreme southern end of the park; however, the only evidence of their appearance in the northern end of the park was two or three trees with a few brown branch tips at the eastern end of Martlings Pond (E. Oppenheimer, personal communication).

In 1928, Davis noted that the periodical cicadas "are not as plentiful about Tottenville as on some of the hills near the middle of the island." In 1979, the Magicicada populations seem to be increasing in some parts of the southern half of the island, for the heaviest emergence

areas were Annadale, Huguenot, and Tottenville. However, T. Weber wrote in 1979, "This time they were not as numerous as then [1962] for we have experienced a lot of building around us [Great Kills]."

TIMING

The mechanism by which *Magicicada* spp. sense the passing of exactly 17 years is unknown. Nymphs do not all grow at the same rate (White and Lloyd, 1975). This may be due to differences in nutrition.

The cue which marks the beginning of an emergence is better understood. Heath (1967) has shown experimentally in the field that ground temperature has an influence. Reports of cicadas emerging early in cleared areas or under greenhouses (Marlatt, 1907) support his findings.

In 1979, the spring weather was unusually rainy and cool in the northeast. An exceptional heat wave, May 8-11, did not bring the cicadas out en masse even though holes, mud turrets, or occasional nymphs had been seen since the early part of April.

Large numbers of adults began emerging May 17 (High Rock Park) through May 21 (Annadale and Lighthouse Hill). The cool wet weather extended the emergence until June 5 in some areas (e.g., Richmondtown and Lighthouse Hill).

The cool weather also delayed the onset of chorusing but by May 31 all three species were singing loudly. *M. septendecim* was as usual the most common species. *M. cassini* was found in numbers in three places (marked by solid black dots on Figure 2): the corner of Huguenot and Arthur Kill Road, Arden Heights; Barclay Ave., Annadale; and at the corner of Harold Ave. and Kinghorn St., Annadale. *M. septendecim* was also present at each of the above localities. *M. septendecula* was found only at Buck's Hollow in the Greenbelt. It was very abundant on a cut-over hillside and in tall near-by Hickory trees. As always, *M. septendecim* was also present. The two smaller species may have occurred in other areas of the island but no extensive search was made for them.

Davis unknowingly lumped *cassini* and *septendecula* and called both *cassini*, "the dwarf form of the periodical cicada." The difference in coloration was at that time attributed to individual variation. He reported the dwarf form from four places: Willow Brook, Westerleigh, West New Brighton, and Rossville (marked by solid triangles on Figure 2).

This year, mating was observed May 31 (Buck's Hollow), June 1 (Wheeler Ave., Castleton Corners); June 10 (Kinghorn St., Annadale), and June 11 (Labau Ave., Sunnyside). Egg laying followed several days later. By June 21, the cicadas were on the decline and by the 1st of July, only a few were left singing.

Fig. 2

Map of the distribution of Brood II of the 17-year cicada on Staten Island.

Stippled area is that in which trees were "flagged" with brown, dead leaves as a result of the oviposition damage caused by the periodical cicada.

Solid black circles indicate localities where *cassini* was found in 1979.

Solid black triangles show where Davis found the "dwarf form of the periodical cicada."

Hollow circles indicate where *septendecula* was found in 1979.

Hollow stars represent two localities reporting 17-year cicadas this year outside the flagging zone.

Black bullet with hollow star marks the location of the Staten Island Institute of Arts and Sciences and the area where cicadas were abundant in 1877 and absent (except for a few individuals), in subsequent years.

Figure 3 presents a summary table of the timing of the 17-year cicadas on Staten Island over six generations and some comparative data from other areas of the distribution. Records collected this year are printed below:

April 8	Holes and nymphs, Buck's Hollow.
April 29	Many nymphs above ground, Douglas Rd, Emerson Hill.
May 1	Nymphs seen under boards, Douglas Rd., Emerson Hill.
May 6	Nymphs above ground and turrets 11-12/sq. ft., Wolf's Pond Park.
May 7, 8	Many holes, and nymphs climbing trees, no locality.
May 9	Holes seen on Arthur Kill Rd. between Yetman and Lee Aves. and in the woods in the Tottenville area near Main St. and Amboy Rd.
May 10	Holes and turrets seen at Richmond Hill Rd. near Rockland Ave. and at Great Kills; Beech Rd. near Eltingville.
May 12, 13, 14	Foggy rainy cool weather. Temperature supposed to reach 70° F tomorrow.
May 17	Cicada adults begin emerging at High Rock Park. Egbertville.
May 19	Adults begin emerging at Oak Ave., Oakwood.
May 20	Adults seen on King St., Great Kills. No song yet.
May 21	A few live adults reported in the morning at St. George Rd., Lighthouse Hill and Harold Ave. and Kinghorn St, Annadale. The evening of the 21st many adults emerged at the latter address. Adults seen but no song heard yet, Lincoln and Greeley Aves., Midland Beach.
May 22	First cicadas seen on Helena Rd. and emergence continues on Lighthouse Hill and in Annadale.
May 23	Emergence continues on Lighthouse Hill and in Annadale. Several hundred holes located in empty lot corner of Brookfield and Genesee Aves., Great Kills.
May 24	Heavy rain, foggy and overcast.
May 25	Nymphs and adults found in various stages of emergence, Burbank Ave. and Clawson St., New Dorp.
May 27	Two or three adults and about a dozen holes seen in the garden of the Tibetan Museum, Lighthouse Hill.
May 31	Loud *septendecim* and *septendecula* choruses, Buck's Hollow. Loud *septendecim* choruses Wheeler Ave., Castleton Corners and at High Rock Park. Newly emerged adults still easy to find.
June 1	Loud *cassini* chorus heard at Arthur Kill Road and Huguenot Avenue. Both *cassini* and *septendecim* still

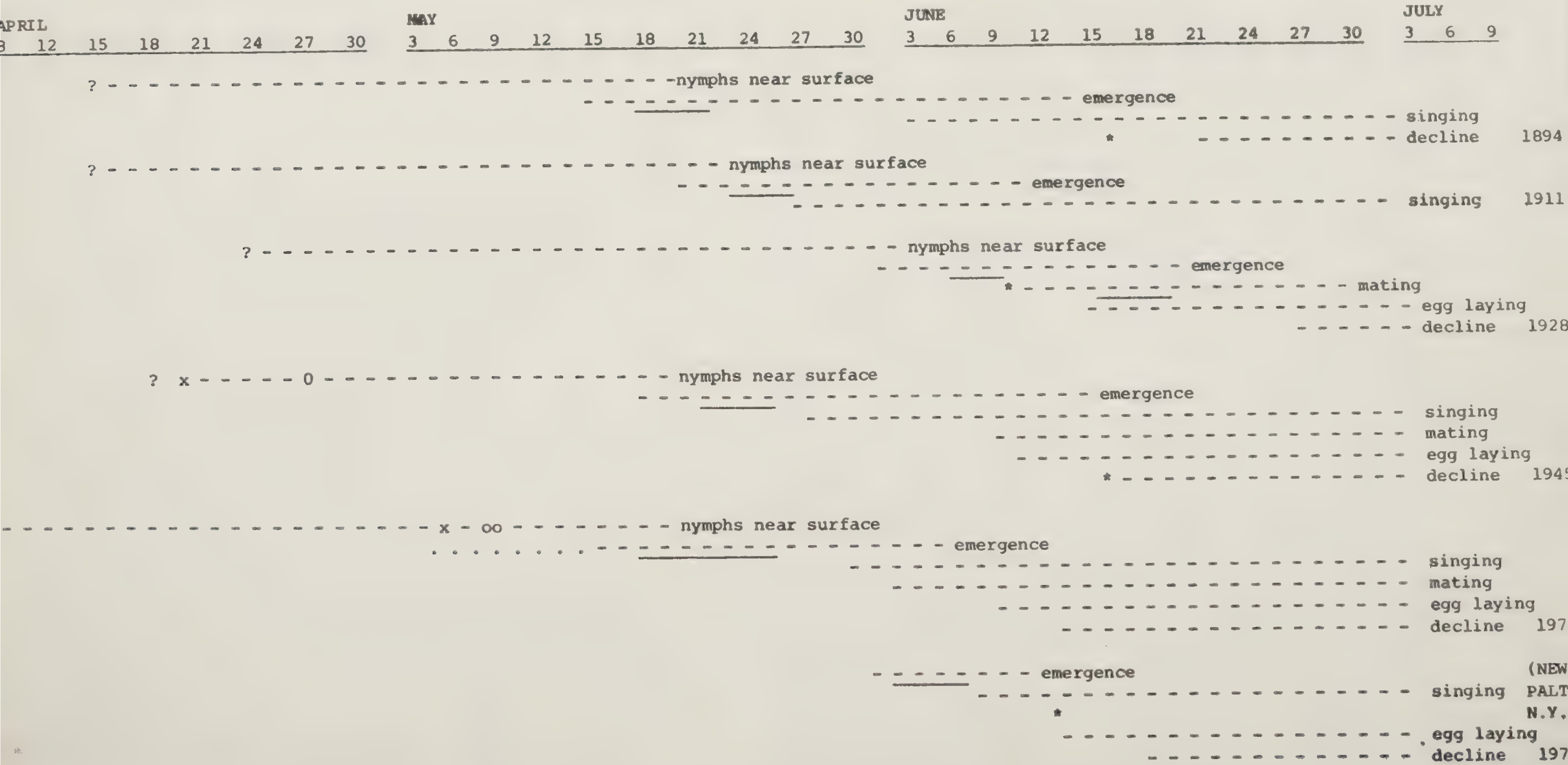

Fig. 3

Timing of the life history events of the 17-years cicada on Staten Island in 1894, 1911,

	emerging. Mating seen, Claypit Road. Hazy and warm, high about 80° F.
June 5	Emergence on Clarke Avenue, Richmondtown (day) and continues on Lighthouse Hill (night).
June 9	Loud chorusing; many dead cicadas on ground, Kinghorn Street, Annadale.
June 10	Cicada mating in Annadale, Kinghorn Street.
June 11	Hundreds dead, dying, and mating on Labau Avenue, off Victory Boulevard, Sunnyside. Rain.
June 13	Cicadas abundant at Bunker Pond.
June 14-18	Cicadas extremely abundant and active in Annadale. Egg-laying noted.
June 19	Numbers somewhat less on Lighthouse Hill.
June 21	On the decline, Lighthouse Hill; many dead and dying.
June 23	Live as well as dead cicadas. Loud chorusing. Egg laying. LaTourette.
June 26	Still a few cicadas singing, Lighthouse Hill.
June 29	Not too many left, mostly *cassini,* Annadale.
July 1	No live cicadas but many dead branches, Clay Pit Ponds State Park and Preserve.

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APPENDIX

The following is a summary of localities where cicadas were observed in previous generations. These locations are taken mostly from the notes of W. T. Davis, John Koestner (1945), and Joseph F. Burke.

1894 Old Place Meadow; Willow Brook; Moravian Cemetery; Clinton Avenue; Todt Hill; one-quarter mile from Watchogue Beach; Clove Road in West New Brighton; in the woods near Oakwood Beach.

1911 The Leng home on Clove Road; Great Kills; Richmond.

1928 In the woods west of Richmond; Todt Hill; in the Clove Valley on a hill near Housman's Cave; in the Clove Valley at Britton's Upper Pond; 960 Fingerboard Road; Great Kills; Watchogue; Page Avenue.

1945 960 Fingerboard Road; 81 Acacia Avenue in Great Kills; 154 Detroit Avenue in Annadale; Grymes and Emerson Hills; Richmond Avenue in Eltingville; 755 Pelton Avenue in West Brighton; 218 Potter Avenue; Wagner College; corner of Schmidt's Lane and Manor Road; Ellicott Place.

1962 Castleton Corners between 41 Reon Avenue and Todt Hill Road; Vroom's field (now North Gannon Avenue); 392 St. George Road between Lighthouse Avenue and Aultman Avenue; 173 Bidwell Avenue near Springfield Avenue; 714 Bard Avenue near Mathews' Avenue; Staten Island Zoo; Benziger Avenue between Bismarck and Westervelt Avenues; on the eastern side of Edgewood Road in Great Kills; 151 Fiske Avenue near College and Jewett Avenues; Hylan Boulevard from Hales Avenue to the Woods of Arden Road; corner of Richmond and Augusta Avenues in Eltingville; Irvington Street and Chester Avenue; 6215 Amboy Road in Pleasant Plains near Goff Avenue and Bloomingdale Road; 33 Valencia Avenue near Randall Avenue; Clove Lake Park; W.. T. Davis Wildlife Refuge; 146 Stuyvesant Place near Hyatt Street; S. I. Museum building, Stuyvesant Place and Wall Street; and from Great Kills to Annadale.

Additions to the Breeding Bird List 1978

by Norma and William Siebenheller

Sharp eyes and perseverance throughout the spring and summer produced thirteen additional species for the current breeding-bird survey. In species order, the new discoveries are:

1. CANADA GOOSE. Never before on Island lists, this species was found nesting in a shallow landfill pond, where one pair raised six young. The area, however, is scheduled to be filled in the near future, and if the birds return in succeeding years they may have to seek new quarters.

2. BLUE-WINGED TEAL. Information reached the committee belatedly that a pair with young had been seen at Great Kills Park in 1974. This fact, coupled with numerous spring sightings and the discovery of a pair at Great Kills Park on June 17, of this year, has prompted us to include the teal on our list once again.

3. VIRGINIA RAIL. In the same pond where the Canada geese were noted, a pair of Virginia rails was observed with at least one young. This is the first confirmed breeding of this species since the mid-1930's, though very likely the birds had bred undetected at least periodically in the interim.

4. SPOTTED SANDPIPER. Long on Island nesting lists, the spotted sandpiper was left off last year's compilation because of a lack of recent evidence. This season, however, a number of observers noted territorial behavior in at least three locations through mid-July and, although no young were seen, this behavior was accepted as proof that the birds still are breeding here.

5. GREAT BLACK-BACKED GULL. On a trip to Hoffman and Swinburne Islands with the National Park Service in May, we discovered eggs of the great black-backed among the hundreds of herring gull nests on the two islands. The black-backs make up approximately 2 to 3% of the population there.

6. GREAT HORNED OWL. No doubt the most exciting ornithological discovery of the year locally was the nest of the great horned owl in Moravian Cemetery. This find, by Bob Clermont, established the bird as a breeder here for the first time ever.

7. WILLOW FLYCATCHER. Male willow flycatchers could be heard in June at several points along the entrance road to Great Kills

Park, and at least one remained at mid-July. Another was heard in early summer at Davis Refuge. All this was evidence enough, the committee felt, that the bird should be considered a breeder in 1978.

8. EASTERN WOOD PEWEE. Two males sang regularly at High Rock Park well into July, and were seen carrying food on several occasions. On the basis of this, the pewee was restored to the list.

9. FISH CROW. A nest with young was examined and photographed by a number of local birders in late April, near the Fresh Kills Bridge. Its size was considerably smaller (13") than the nest of the common crow.

10. RED-EYED VIREO. At least two male red-eyed vireos were heard singing in mid-July in woodlands on the west side of Todt Hill, and a pair was observed carrying food in the same location. Later another male was heard near Bloomingdale Road, proving to the satisfaction of the committee that although they are greatly diminished, these birds have not disappeared as breeders on Staten Island.

11. PINE SISKIN. Siskins came in record numbers during the winter of 1977-78 and a number of pairs apparently stayed to breed. Birds came regularly to feeders through May, in a half-dozen locations, and in one place stayed until June 24. More importantly, young birds were seen in two instances during late May. So the pine siskin, which appeared as a breeder for the first time in 1976, can be counted once more. It is notably erratic, however, and cannot be expected to breed here regularly.

12. SAVANNAH SPARROW. The Savannah sparrow had never been confirmed as a local breeding species although William T. Davis considered it "probable." But in 1978, proof was found: in the fields next to the South Beach Psychiatric Center, a small colony was uncovered which included singing males and, later, young birds. The Savannah thus moves from "probable" to "definite" in our list.

13. GRASSHOPPER SPARROW. For several years it has been suspected that this species was breeding in the same South Beach fields mentioned above. This season, increased surveillance proved the birds' presence weekly into mid-summer, with at least three males singing and otherwise behaving territorially. This is the first confirmation for the grasshopper sparrow since the 1950's.

The fifty-nine birds listed in last year's survey are still considered to breed here, with the possible exception of the white-breasted nuthatch and the oven-bird. Neither was heard, nor were they seen, after mid-May, despite intensive searching. We will make these birds a priority in 1979.

Other interesting finds in 1978 included young screech owls in Sunnyside; a wood duck with young in Huguenot; a hairy woodpecker nest in Buck's Hollow; and a second heronry, containing (at least) cattle

egrets and snowy egrets, at Prall's Island. The latter, discovered by Bernard Paul and Bernie Jr., with Harry Jenkins, will be explored more thoroughly next year. It is very likely an "overflow" from Shooter's Island.

Many people helped with this survey, but special thanks go to Bob Clermont for the great horned owl; to Karl Cerasoli for the Canada goose, Virginia rail, and fish crow; and to Richard Zaineldeen and Bill Flamm for the Savannah sparrow and grasshopper sparrow.

THE POND SURVEY, Staten Island, New York 1975-1976. Part VI.

ECOLOGY
by Albert J. Hendricks, Ph.D.

Discussion of the Collective Ecosystem with Ponds Influenced by Raritan Bay

The four ponds in this ecosystem are located along the south shore of Staten Island, starting with Uncle Ed's Pond in Tottenville, followed successively by Salt Pond in Pleasant Plains, but alongisde Prince's Bay; Wolfe's Pond in the Prince's Bay section of the Island; and Seguine Pond in the Huguenot Section. Probably, at one time Arbutus Pond would have belonged in this ecosystem, but it is now well sheltered from salt water spray by a thick buffer zone of trees and shrubs, and high tide influences are non-existent because an elevated, wide, weedy field separates the pond from the sea.

At any rate, all of the ponds in this series are affected by the waters of Raritan Bay by spray and spume blown onto them from the Bay during heavy storms, or on windy days, but especially during the winter. Two of the ponds—Salt and Seguine—were observed during the summer of 1975 to have been breached by the sea after two different heavy rainstorms. In each case the sandy beach that had separated fresh water from salt was washed away sufficiently to permit fresh water to drain out almost completely during low tide, with a subsequent inflow during high tide of salt water to effect more or less complete inundation. Moreover, it was learned from a long-time resident near Wolfe's Pond that during a hurricane in the 1950s, this pond, too, was breached, although since then it evidently has been secure from this severe encroachment.

Chemical analysis of the waters of these four ponds, done early in the summer before any breaching had taken place, showed an average of over 100 mg./1., of chloride present in comparison to values of around 6 mg./1. in ponds of the series on ground moraine, and the rest of the ponds on terminal moraine at low elevations. Other water chemistry values were found to be similarly influenced. The average pH was 7.2; the DO/CO_2 ratio was 10.5/5; and values for total hardness and alkalinity were 69 and 70 mg./1., respectively.

Perhaps it should be noted here that in addition to the dramatic disruptive effects that Raritan Bay has had on ponds of this ecosystem, human activity around and in the ponds has also drastically affected their natural condition. To illustrate: The terrestrial vegetation around all of the ponds in this series consists as much of introduced trees, shrubs, vines and weeds as it does of native vegetation. Moreover, the

distribution and mixture of the various plant species to be found have been critically influenced by roads, sidewalks, domiciles, drains, and other artifacts to such an extent that these ponds no longer have very much beauty to recommend them to nature-lovers. Perhaps Wolfe's Pond should be excluded from this categorization because the custodians of Wolfe's Pond Park do keep the park grounds and the pond itself free of litter and junk. However, the steep banks and hills around Wolfe's Pond have received excessive trampling without any planting of replacement grasses and shrubs, and are consequently now undergoing severe erosion. According to comments received from various residents in the Huguenot section, Seguine Pond at one time was a beautiful spot, which seems difficult to believe now because its steep banks are presently lined with shanties and tumbled-down houses, and junk and litter cover a good portion of its banks.

UNCLE ED'S POND

Uncle Ed's Pond, in Tottenville, is probably not a natural pond. Old maps show "Uncle Ed's Woods Brook" moving southward through "Uncle Aaron Van Name's Swamp" to drain into Raritan Bay. Where this brook was shown to empty into the Bay is approximately where Uncle Ed's Pond is now, perhaps some thirty feet or so from the high tide line of the sea on the adjoining beach. It seems very likely that at least two artificial factors caused the pond to form. First, it seems that dredge spoils from the Bay have been dropped in the area with the possible effect of reducing water percolation downward; second, Surf Avenue once formed a stout barrier between the sea and the former swamp; now broken and forgotten, it allowed water to build up into a pond. Of course, a rough dirt road is still there forming a dike, but there is now a deep gully that received water from the pond and elsewhere, and conducts it to the nearby sea.

Today a thick ring of tall reed grass forms an all but impenetrable barrier around this small pond, totally hiding it from the view of a casual passer-by. At the northeast corner of the pond, along Aspinwall Street, a copse of woods has in its canopy: black locust, hackberry, pin oak, and white mulberry trees. Beneath this layer, in the second story, saplings of sassafras and chokecherry trees vie for space with dwarf sumac and common elder bushes, and shrub-like growths of the tree-of-heaven. A dense ground cover was found to consist of tall blackberry brambles, poison ivy vines, Virginia creeper and Japanese honeysuckle. Along the ditch separating Aspinwall Street from the pond, a grab-bag mixture of herbaceous weeds was seen growing next to the tall reed grass in profusion. These included tall weeds such as tall goldenrod, wrinkled goldenrod, pokeweed, wild carrot, parsnip, common sorrel, and Japanese knotweed. Other weeds in the ditch were yarrow, common milkweed, and dayflower. Other common weeds seen in the vicinity that

also help to point up the disturbed condition of the area were Canada thistle, common ragweed, Indian hemp, evening primrose, and great ragweed.

To be sure, all of these introduced weeds were accompanied by their associated fauna such as small milkweed bugs, and the fifteen-spotted ladybird beetle, with the former being found on milkweed plants and the latter on goldenrod. Some of the birds seen in the pond vicinity were: common blackbirds, redwing blackbirds, robins, and others. Concealed on the pond, or near it in tall grass, were black ducks, green herons, and a young great blue heron. A couple of muskrats, were also seen in the pond's water. The tall reed grass was essentially the only plant around and in the shallows of the pond. There were no woody shrubs seen, nor plants like pond lilies. The main plant in the water in prolific amounts was leafy pondweed, which seemed to cover the entire bottom of the pond. However, floating on the water was a somewhat uncommon duckweed. As might be expected, the water of the pond was rich in macro- and microorganisms. Nymphs of damselflies crawled on the pondweed, and backswimmers sped around. Pupae of midges drifted with wayward currents. Cladocerans by the thousands were present including *Bosmina longirostris, Kurzia latissima, Daphnia, sp.*, and *Camptocercus* sp. Ostracoda such as *Eucypris virens* and *Cypridopsis vidua* were present in great numbers. Species of *Cyclops* in myriad numbers were also seen.

Algae of many kinds grew profusely in the pond at the height of the summer of 1975 and sheltered rotifers such as *Trichocerca multicrinis* and *Epiphanes senta.* These were found among strands of the true-green alga. Other algae identified were a blue-green alga, a large desmid, and some diatom species of *Navicula* and *Fragilaria.*

Organisms identified from plankton samples were found to be: Macroorganisms: some brown hydra, worms such as *Dero vaga* and *Aeolosoma hemprichi,* and stato-blasts of *Pectinatella magnifica.* Microfauna: *Difflugia urceolata, Amoeba proteus, Paramecium aurelia, Arcella dentata, Actinophrus sol, Actinosphaerium eichornii, Paramecium caudatum, Didinium nasutum, Spirostomum ambiguum,* and *Carchesium polypinum.* Algae: *Peranema trichophorum, Euglena gracilis, Euglena viridis, Pediatrum simplex, Micrasterias truncata, Spirogyra porticalis, Oscillatoria agardhii, Oscillatoria splendida,* and species of *Navicula, Pinnularia, Tabellaria,* and *Gomphonema.*

SALT POND

This pond is aptly named because of its evident frequent inundation by sea water. Its location on Mt. Loretto property is only about forty yards from Raritan Bay, from which it is separated only by the sandy beach. A short brook meanders diagonally through a shallow gully connecting

the pond to the Bay. On June 18, 1975 the pond waters were found to have 200 mg./1. of chloride, which is high in comparison to that found in other ponds, but, of course, is very low compared to the brackish water of Raritan Bay. The pond was visited again on August 17th, 1975 at which time it was observed that the entire character of the pond had changed since June. Formerly, the pond was covered with water ranging in depth from six inches or so up to occasional spots with about two feet of water. In August the pond was very low and was still draining when observed. The view was of low mud flats alternating with shallow puddles, although there was one larger pool at the western end of the pond area. There was evidence that the pond had been at least partially inundated by salt water. Fragments of a true-green alga normally found in Raritan Bay, sea lettuce, pieces of a marine brown alga, rockweed, and some broken, small pieces of some marine red alga were seen scattered across the mud flats and in the puddles, but were especially thick in the channel leading to the outlet to the brook that empties into Raritan Bay. When the pond was visited again on October 7, it was observed that sea water from the Bay was pouring into the pond, and in a short while, salt water appeared to reach every nook and cranny of the pond. Clearly, the effects during the summer of the pond's water going from only 200 mg./1. of salt in water to at least 20,000 mg./1. must have been drastic on the aquatic flora and fauna. If this high oscillation of fresh, brackish, and salt water occurs annually, it must be the critical limiting factor for almost all organisms in this pond's waters. Naturally there might be a few species in the pond that are more affected by exposure and inundation with rising and falling water levels in the pond caused by periods of drought or heavy precipitation, or by high and low tides. It might be, too, that some kinds of organisms are unusually sensitive to wide temperature ranges, or rapid temperature changes caused by fluctuating water levels.

As for the vegetation that surrounds the pond, the primary environmental influence on the pond's north side near Hylan Boulevard is provided by human actions, while to the south of the pond perhaps the main influence must be the sea with its sandy shores, salt spray, and openness to wind. Woody vegetation is limited to the north and eastern sides of the pond. A grove of trees near the corner of Hylan Boulevard and Sharrott Avenue was seen to be dominated by numerous plants of tree-of-heaven, although one very tall and broad ward willow grows there also. The tall second story mainly consists of specimens of tree-of-heaven, too, although they are younger trees. They are heavily infiltrated by climbing vines of American bittersweet. The short second story is a mixture of sassafras, arrowwood, and saplings of hackberry. Ground cover was observed to be dense, and consisted of a tangle of poison ivy, Virginia creeper, and Japanese honeysuckle vines mixed with blackberry brambles. Here and there, tree-of-heaven suckers and

hackberry seedlings managed to poke through the vines near the ground, as well as large numbers of the day-lily herb and stinging nettle.

To the south of this copse of trees, a dense, shrubby thicket intervenes between the copse and marsh grasses and hedges around the pond. This thicket was found to be an unyielding thicket and bramble patchof plants such as common elder, wild rose bushes, blackberry canes, vines of Virginia creeper and Japanese honeysuckle, and weedy herbs such as day-lilies, mullein, and yellow rocket. Immediately around the pond, but especially toward the Bay, tall reed grass was seen to form a high, partially effective buffer zone between the pond and the beach or sea. Mud flats between the tall reed grass and the pond water had numerous scattered colonies of salt grass, cordgrass, black grass, and salt-meadow grass. On the high beach, just outside of the buffer of tall reed grass, a mixture of annual and perennial sedges, grasses, and herbs was seen to be obviously reducing wind-drifting and erosion of beach sand. These included plants such as marsh elder, New England aster, sandbur grass, umbrella sedge, and cocklebur. Birds were quite numerous and diversified in the pond area. There were considerable numbers of red-winged blackbirds, swamp sparrows, swallows, black ducks, snowy egrets, sanderlings, and then one or two common gallinules. On the water in early summer, duckweed and floating clots of algae drifted to the lee side of the pond accompanied by assorted insects. Some giant water bugs were seen, as well as large numbers of midge pupae and quantities of water striders and other insects. Thousands, or more likely, hundreds of thousands of killifish, threshed about in shallow water and provided food for wading birds and bait for fishermen. The water was rich in bright-green colonies of *Euglena* sp., algae, and other less brightly-hued algae such as *Sphaerocystis* sp., *Tetradesmus* sp., one-celled *Bracteacoccus* sp., and *Roya* sp. Feeding or sheltering among these algae were numerous individuals of *Onychocamptus* sp. (Copepoda), and *Asplanchna* sp. (Rotifera).

GEOLOGY & WATER QUALITY
by Hans Behm, M.S.

UNCLE ED'S POND

This little pond is located between Aspinwall Street to the east, Finlay Street to the west and Billops Avenue to the north, in Tottenville. In the summer of 1975 the greater diameter was approximately 180 feet and the lesser diameter about 150 feet. It was difficult to measure the total surface area because much of the periphery of the open waters is hidden by a dense growth of *Phragmites communis*. Aerial photographs have not been of much help. The deeper and open waters of Uncle Ed's Pond amount to less than one-half acre. The average depth in the summer of 1975 was 1 to 1½ feet. The slope around the pond is very gentle and is less than 5°. The turbidity (Secchi disk) factor was 1 foot. The pond is about five feet above sea level. It is near enough to the open waters of Raritan Bay to be affected by extremely high tides and salt spray during severe nor'easters. The temperature of the water was 71°F on July 2, 1975.

Geologic Setting. Uncle Ed's Pond is located on a man-made and much disturbed land, resting on what was formerly a large salt marsh. The pond is underlain by an extensive layer of a very dense bluish gray clay, approximately two feet thick, produced around the turn of the century when sluicing operations in Raritan Bay diverted the sludge and muds into the marsh. In time, the liquified clays stratified and solidified, with much of the heavier grains settling out first. This clay is also exposed along the shore from the end of Aspinwall to Carteret Streets. For many years, artists have collected this clay. Unfortunately, much of the clay has been eroded away by wave action, including the glacial banks on which it rests.

The main outlet for this pond runs over what is left of Surf Avenue, a deep gully having been produced by the rather forceful movement of the waters of the outlet channel during periods of high precipitation. In 1976, this pond completely dried up during the dry summer months, leaving behind a conspicuous mud-cracked bottom. In the fall of 1976, it was filled again after heavy rains. It was full to its brim when I last observed it at the end of March, 1977. In 1979, Surf Avenue has been partially washed away by storm activities.

Historical Anecdotes. Uncle Ed's Pond perhaps receives most of its water from Uncle Ed's Brook. According to William T. Davis' map of 1898 , Uncle Ed's Brook originated in the general area occupied formerly by Elliott's-, Long-, and Three Muskrats Ponds. Its course, first in a general southeasterly direction and then southerly, led it directly into Raritan Bay at Christopher's Gully.

The area now occupied by Uncle Ed's Pond was formerly known as

"The Meadows." The Atlas of Staten Island (1887 issue) shows the site now occupied by this pond to have been an extensive marsh, possibly a salt marsh.

The general stratigraphic sequence is as follows: glacial till and glaciofluvial deposits of the Harbor Hill Terminal moraine; organic salt marsh deposits; bluish gray clay; recent organic muds and sands along the shore areas and near the beach.

Description of Sediments. Uncle Ed's Pond is largely surrounded by recent sands and gravels. The partially to completely overgrown slabs of concrete of the abandoned sidewalks, constructed during the 1920's, are in close proximity of the pond and sort of confine it on three sides. Occasionally, due to erosion, some particles find their way into the pond and mix with the bottom muds. This results in the addition of $CaCO_3$ to the pond's waters. Much of the accumulating man-made debris, including many abandoned cars, produce a plethora of artificial grains and fragments, which are eventually incorporated into the natural sediments. You find such things as pieces of glass, bricks, all sorts and variety of plastic, clothing, paper, rubber from tires, and much more. Their shape and size are a function of resistance to disruptive forces such as waves, currents, abrasion, corrosion and human activities. During periods of high tide, combined with intense storm activity, considerable salt spray finds its way into the pond, raising the salinity. During protracted periods of drought, winds pick up smaller particles and deposit them in the pond.

Microscopic Analysis of Sediments. The unprocessed probes consisted of brown clays with layers of grayish blue clay. A clay collected at the end of Carteret Street is very dense and bluish gray, very pure with little coarse fraction. The bottom clays within Uncle Ed's Pond were more or less mixed with organic debris.

The washed residues reveal much clear and fragmented angular to subangular quartz; milky and white subangular to subrounded quartz, including a few that reveal crystal faces. The samples also contain pinkish subangular, smoky and limonite coated quartz grains. Moreover, the residues contain hematitic, iron-stained and iron-oxide spotted quartz. I also found a few grains of citrine (yellow quartz). The clear quartz grains are the most angular within the finer fraction. The remainder consists of many varieties of fragments of granites, gneisses and dark igneous rocks. The constituents of the Newark Group are abundant and consist largely of subangular to subrounded fragments of red shale and some pinkish arkosic particles. A few grains of rounded and subrounded grains of olive-, light-, and brownish green glauconite are also present. In addition, the samples contain fragments of conglomerate, some green mica, chloritic material, garnet, jasper, limonite and some magnetite.

The finer fraction contains an abundance of black fly ash, in-

cluding very small, hyaline white spheres. They also contain much charred plant debris, the result of seasonal brush fires.

The fine portion's sedimentary particles ranged in size from .62-.5 mm and the coarser from .5-2.00 mm and over.

Microscopic Analysis of Faunal and Floral Constituents. The diatom flora includes *Coscinodiscus* sp., *Triceratium favus, Biddulphia pulchella, Actinoptychus* sp., *Campylodiscus* sp., *Auliscus sculptus* and many smaller unidentified species. The brackish-water foraminifera are represented by *Trochammina macrescens.* Gastropoda are abundant and range in size from less than 1 mm to 3mm. Ostracoda are fairly abundant, with *Cypridopsis vidua* and *Eucypris virens* as the most representative species. Included in the samples are a great variety of seeds and insect parts.

The periphyton revealed many ostracoda, principally *Cypridopsis vidua* and *Eucypris virens; Difflugia corona,* a testacean, which was attached to the undersides of the duckweed, a number of Volvox colonies and many insects.

Comments on the Weather. July 2, 1975 was a clear day with a few *Cirrus* and *Cirrostratus* clouds. Visibility was excellent, the relative humidity low and the wind intensity averaged 0 to 5 knots from the southwest.

SALT POND

According to the old records, this pond is so named because "the tide flows into it." Salt Pond is located approximately northeast of the intersection of Sharrots Avenue and Hylan Boulevard, or northeast of the Princes Bay Lighthouse on top of Mt. Loretto. The greater diameter is approximately 590 feet and the lesser diameter about 330 feet, but the total surface area varies considerably. At its maximum during the summer months in 1975, the surface area was 2.7 acres. The depth also varies greatly because of the inflowing and outflowing tidal waters, but may reach a depth of eighteen inches to 2 feet in places. The peripheral slope is gentle and less than 5°. The true outline of this pond is difficult to establish on aerial photographs because of an extensive and dense growth of *Phragmites communis* that obscures its periphery.

The area is an extensive salt marsh and temporary tide pools, with interconnected creeklets and open mudflats at low tide. Typical salt marsh vegetation is present: *Spartina alterniflora* Loisel, *Spartina patens* (Ait.) Muhl, *Phragmites communis* Trin., *Distichlis spicata* (L.) Green, and *Iva frutescens* L.

During periods of high rainfall, coupled with the formation of a dam at the end of the outflow channel, fresh-water conditions prevailed in this pond in the summer of 1975. But the onset of sudden squalls and cloudbursts brought disaster to this area. The outflow channel simply could not handle the enormous volume of outflowing water into the

bay. As a result, the outflow channel was breached, draining the temporary fresh-water body and drastically changing some of the fauna and micro-fauna in the pond. On many occasions I have observed deposits of sea lettuce (*Ulva lactuca*), *Fucus* sp. and many red sea weeds stranded and beached along the outflow channel and the periphery of the pond, attesting to the violence of the waves and the high waters as a result of a major northeaster on August 18, 1975.

At low tide, Salt Pond is an expanse of mudflats and creeklets but at high tide it resembles conditions that prevailed in the summer of 1975, when it was a fresh-water body.

The bottom of Salt Pond consists of oozy and silty black organic muds.

The 1887 Atlas of Staten Island shows no connection between this pond and the open waters of Princes Bay; however, Davis' 1896 map does show a connection to Princes Bay. In some ways the area is similar to the Lemon Creek area. Both are brackish water environments and the foraminiferal assemblages are very similar. I have not observed such genera as *Ammobaculites* and *Ammoastuta*. The latter is present in the Lemon Creek estuary and the genus *Ammobaculites* is common in Richmond and Main Creeks, which Mr. Grekulinski and I studied in great detail in the 1950s. The results of this study were published in the 1958 Spring issue of the Institute's Proceedings.

Salt Pond and vicinity is frequented by thousands of fishermen and visitors during the warmer season. Many net killies and use them for bait for larger fish. This area should be saved for future recreational use and educational purposes.

Mt. Loretto, a little over 70 feet above sea level, is located south of this area. The seaward bluff of this conspicuous hillock reveals deposits of glacial till and stratified drift. Below the Pleistocene glacial deposits are partially exposed, Upper Cretaceous sands and clays that include many ferruginous concretions, probably belonging to the Magothy Formation. Many have expressed the desire to save this area as a geologic monument. A similar exposure can be seen along the shore at Cliffwood Beach, New Jersey.

Geologic Setting. Salt Pond is located on black organic muds which in turn overlie denser bluish-gray clays. Along the shore between the pond and Princes Bay the terrain consists largely of recent sands and gravels of post-glacial age, more or less intermingled with glacial till of Pleistocene age. The glacial deposits are a deep reddish brown because of the inclusion of red shale fragments and clays of the Newark Group, which are Upper Triassic in age. A number of erratics dot the landscape. The outflow channel revealed much coarse sand and gravel, the fines having been removed by the flow of tidal waters. Most of this sand and gravel was derived from the glacial deposits nearby. A great variety of shells of all sizes are intermingled with the sediments.

The stratigraphic sequence is as follows: Upper Cretaceous sands

and clays; a thin veneer of glacial till and outwash; and, recent dense clays capped by black organic muds.

Description of Sediments. The glacial Pleistocene deposits consist of rounded and subrounded fragments of the Newark Group. There is an abundance of gneiss, granite, basalt, quartzite, conglomerate and many sandstones. An occasional boulder, cobble or pebble of limestone, containing Paleozoic fossils, may be seen in places. The shore at the base of the bluff has been reinforced with metamorphic rocks to minimize the effects of erosion. The huge blocks were brought here from excavations in the New England Uplands region.

The beach deposits adjacent to the pond consist of sands partially or wholly stained with yellowish iron oxide. Mixed in with the quartziferous sand are many shells of the pelecypods and the gastropods. Heavy sands (largely magnetite), form dark patches and bands at high tide level. The sediments are contaminated with broken glass, plastics, fibers, wood, rubber and rusty iron. Much driftwood, garbage and other man-made products adorn the landscape and the beach.

Microscopic Analysis of Sediments. The processed samples contain a high percentage of angular and subangular clear, transparent and white quartz; some rounded grains are present in the coarser fraction. The samples also contain a few wellrounded frosty, pinkish, deep-rose and blood-red grains of quartz, largely angular and subangular. The probes also contain some yellowish and rusty brown quartz grains that are angular to sub-angular. Some smoky and grayish quartz is also present. A few grains of quartz reveal partial crystal faces. Some flint and jasper is also present. Other constituents include fine-grained, rounded, subrounded and elongate fragments of the shales and sandstones of the Newark Group, of Upper Triassic age; the grains are pinkish and brick-red. A great diversity of gneiss is present. Moreover, the probes contain some dark-, deep-, and olive-green glauconite; some hematite, a few grains of rounded garnet, muscovite and biotite, hornblende, pyroxene, actinolite, chlorite, tourmaline, magnetite, and limonite.

Microscopic Analysis of Faunal and Floral Constituents. Diatoms studied include *Coscinodiscus* sp., *Triceratium favus, Surirella* sp., *Biddulphia pulchella, Auliscus sculptus* and *Actinoptychus* sp. Brackish water foraminifera are represented by *Trochammina inflata,* the dominant species: *Tiphotrocha* (Trochammina) *comprimata,* including many early ontogenetic stages; *Recurvoides* sp. and a few specimens of *Arenoparella mexicana.* A few specimens of *Elphidium,* an estuarine form, were also present. *Cypridopsis vidua,* and ostracode, fish scales, worm jaws, chitinous insect parts and much charred plant debris make up the remainder of the organic constituents.

COMMUNICATIONS:

CHRISTMAS BIRD COUNT, December 16, 1978

The weather made this a perfect day for the count: Temperatures fluctuated between a mild 35 degrees and a high close to 50 degrees. The wind was light in the cloudless morning, becoming more noticeable in the partly-cloudy afternoon. Every salt-water body was open, reflecting a relatively mild autumn. Much of the fresh-water ponds, however, were frozen over.

In spite of these superior conditions the count was not especially good. The 83 species listed were one less than the previous year's total, which also was quite low. Many passerines were present in low numbers only, otherwise altogether absent. The latter was particularly true of the northern finches such as pine siskins, which were so numerous on Staten Island last year.

On the other hand, the numbers of raptors seemed to be up in most cases: Red-tailed hawks, rough-legged hawks, and short-eared owls were present at Fresh Kills in above-average numbers, attesting to the increase of rodents resulting from the proliferation of garbage dumped in the area from City barges.

Among the more unusual species sighted were: A great egret was spotted on Prall's Island by John and Lucy James; a Virginia rail was found in one of the ponds or pools in the marshes near the Goethals Bridge by Bernie Paul, Sr., and Jr., and Harry Jenkins. Henry Flamm found both the glaucous gull and the red-bellied woodpecker—the former flying by a Great Kills Beach while the latter was seen at the New Dorp Beach.

A pair of Carolina wrens were found by Bill and Norma Siebenheller in the Lighthouse Hill area. This sighting is important because Carolina wrens have been particularly hard hit by the severe winters of the past two years.

The chipping sparrow was seen in Oceanview Cemetery. A summer bird in these parts, winter records are few. It was found by Carl Cerasoli and Jesse Ottenson.

Observers were: Helen Atlas , Doris Barlow, Mary Benjaminson, Richard Buegler, Stan Caulfield, Carl Cerasoli, Robert Clermont, Gloria Deppe, Charles Fallon, Jeffrey Fallon, Henry Flamm, John James, Lucy James, Harry Jenkins, Michael Kelly, Jacob Kissinger, Ken Lewis, Tom Materfis, Anna meyer, Alex Moir, Jesse Otteson, Bernie Paul, Jr., Bernie Paul, Sr., Charles Pearson, Edna Schmidt, Chris Schillizzi, Norma Siebenhellerl, William Siebenheller, Mathilde Weingartner, Richard Zaineldeen.

Horned Grebe, 224
Pied-billed Grebe, 4
Double-crested Cormorant, 12
Great Blue Heron, 8
Great Egret, 1
Black-crowned Night Heron, 4
Canada Goose, 49
Brant, 461
Mallard, 933
Black Duck, 650

Green-winged Teal, 224
American Wigeon, 1
Wood Duck, 2
Canvasback, 137
Greater Scaup, 960
Common Goldeneye, 153
Bufflehead, 432
Oldsquaw, 130
Common Merganser, 1
Red-breasted Merganser, 29
Sharp-shinned Hawk, 4
Red-tailed Hawk, 31
Kestrel, 18
Rough-legged Hawk, 26
Marsh Hawk, 14
Virginia Rail, 1
Ring-necked Pheasant, 60
Americna Coot, 28
Killdeer, 12
Common Snipe, 3
Purple Sandpiper, 12
Dunlin, 43
Sanderling, 75
Glaucous Gull, 1
Great Black-backed Gull, 9, 181
Bonapartes Gull, 478
Ring-billed Gull, 1,035
Laughing Gull, 60
Herring Gull, 21, 464
Mourning Dove, 258
Barn Owl, 4
Screech Owl, 1
Short-eared Owl, 28
Belted Kingfisher, 12
Flicker, 9
Red-bellied Woodpecker, 1
Hairy Woodpecker, 3
Downy Woodpecker, 42
Horned Lark, 43
Blue Jay, 157
Fish Crow, 33
Common Crow, 1,329
Black-capped Chickadee, 115
Tufted Titmouse, 52
White-breasted Nuthatch, 20
Red-breasted Nuthatch, 5
Brown Creeper, 1
Carolina Wren, 2
Mockingbird, 52
Grey Catbird, 4
American Robin, 16
Ruby-crowned Kinglet, 1
Starling, 13,376
Yellow-rumped Warbler, 31
House Sparrow, 645
Eastern Meadowlark, 6
Red-winged Blackbird, 2,628
Common Grackle, 1
Brown-headed Cowbird, 75
Cardinal, 62
House Finch, 103
American Goldfinch, 96
Rufous-sided Towhee, 2
Savannah Sparrow, 5
Dark-eyed Junco, 437
Tree Sparrow, 38
Chipping Sparrow, 1
Field Sparrow, 16
White-throated Sparrow, 218
Swamp Sparrow, 6
Song Sparrow, 140
Lapland Longspur, 1
Snow Bunting, 202
Individuals: 57,238

WATERBIRD COUNT, January 7, 1979

Horned Grebe, 12
Mute Swan, 2
Canada Goose, 1
Mallard, 73
Black Duck, 112
Gadawall, 4
Pintail, 2
Green-winged Teal, 12
American Widgeon, 25
Canvasback, 94
Greater Scaup, 1590
Common Goldeneye, 37
Bufflehead, 163
Oldsquaw, 80
Red-breasted Merganser, 12
Coot, 3
Brant, 67
Total: 2,289

Participants: Helen Atlas, Robert Clermont, Mathilde Weingartner, Richard Zaineldeen

—Richard Zaineldeen

BIG DAY BIRD COUNT, May 19, 1979

The Big Day Bird Count, instituted in 1975 and held yearly since, had been characterized in its first four years by ever-increasing "scores." From the 129 species recorded in the first year to the 147 seen in 1978, progress had been steadily upward. It was inevitable, of course, that a reversal would eventually occur. Such a reversal did take place in 1979 and when it did, it was substantial.

The total for the 1979 Count was only 111.

The major factor contributing to the decline was the weather — specifically, rain — which not only played havoc with expected migration patterns by falling heavily for two weeks in mid-May, but also hampered participants on the Count Day itself. Many expected species were not present and those that were here were difficult to find under the poor weather conditions that existed during the appointed 24-hour period.

Nevertheless there were a few happy surprises. Four species were recorded which had not been noted in any of the four previous Big Day Counts: red-bellied woodpecker, warbling vireo, yellow-breasted chat, and orchard oriole. A prothonotary warbler, although not new to thelist, was a notable find. And the total of sixteen species of warblers, while not outstanding, was heartening in light of the hostile weather.

A complete list of species follows.

Norma and William Siebenheller

Weather: 70 degrees, Rain
Number of participants: 13
Cumulative total for five years: 187

Common loon
Double-crested cormorant
Great blue heron
Green heron
Cattle egret
Great egret
Snowy egret
Black-crowned night heron
Glossy ibis
Canada goose
Brant
Mallard
Black duck
Gadwall
Green-winged teal
Blue-winged teal
Bufflehead
Red-tailed hawk
Marsh hawk
Kestrel
Ring-necked pheasant
Common gallinule
Semipalmated plover
Killdeer
Black-bellied plover
Ruddy turnstone
American woodcock
Spotted sandpiper
Greater yellowlegs
Lesser yellowlegs
Purple sandpiper
White-rumped sandpiper
Least sandpiper
Dunlin
Short-billed dowitcher
Semi-palmated sandpiper
Sanderling
Great black-backed gull
Herring gull
Ring-billed gull
Laughing gull
Bonaparte's gull
Common tern
Least tern

Mourning dove
Common nighthawk
Chimney swift
Belted kingfisher
Common flicker
Red-bellied woodpecker
Hairy woodpecker
Downy woodpecker
Eastern kingbird
Great-crested flycatcher
Eastern wood pewee
Horned lark
Tree swallow
Rough-winged swallow
Barn swallow
Purple martin
Blue jay
Common crow
Fish crow
Black-capped chickadee
Tufted titmouse
White-breasted nuthatch
House wren
Mockingbird
Catbird
Brown thrasher
American robin
Wood thrush
Swainson's thrush
Veery
Starling
White-eyed vireo
Red-eyed vireo
Warbling vireo
Black and white warbler
Prothonotary warbler
Parula warbler
Yellow warbler
Magnolia warbler
Black-throated blue warbler
Yellow-rumped warbler
Chestnut-sided warbler
Blackpoll
Ovenbird
Northern waterthrush
Common yellowthroat
Yellow-breasted chat
Wilson's warbler
Canada warbler
American redstart
House sparrow
Eastern meadowlark
Red-winged blackbird
Orchard oriole
Northern oriole
Common grackle
Brown-headed cowbird
Scarlet tanager
Cardinal
Rose-breasted grosbeak
House finch
American goldfinch
Rufous sided towhee
Chipping sparrow
White-throated sparrow
Swamp sparrow
Song sparrow

BOOK REVIEW

MINERAL NAMES—What Do They Mean? by Richard Scott Mitchell, Ph.D., Minerology, University of Virginia. Assisted by John Reese Henley. 229 pp. $13.95 Van Nostrand Reinhold Company. 1979.

When an author as well qualified as Richard Scott Mitchell considers the fashion of naming minerals after persons "irrational," then amateur enthusiasts who have often been frustrated because of this method may feel justified. Yet one of the unexpected, surprising effects of this book was that I was made aware that it would now be a loss, historically and sentimentally, to eliminate these names and substitute a formulated name. Previous to reading this book, I was adamantly in favor of exchanging the names for a terminology that would be more relevant and immediately identifiable.

In *Mineral Names—What Do They Mean?*, Mitchell gives a comprehensive wealth of detail and meaningful insights into how minerals were named. He covers all the methods from those now ob-

solete to the newest proposals. The meaning and importance of prefixes and suffixes; hybrid and portmanteau words; the influence of mythology and the contribution of various languages are only some of the topics covered in this fascinating book. It is a tribute to the author's discipline that though the book contains an enormous amount of information, it is very concise and comfortable in size.

The glossary, references, and bibliography are complete and contain many details that may prompt some to delve further and research these subjects to greater depth.

The book passed every test. There was not one mineral or question that I sought information about that was not adequately explained.

Of 2600 minerals now commonly accepted, over 1500 of them have been named in honor of someone. The honoree may be a scientist or minerologist but just as likely may have no association whatever with minerals. This system does nothing to indicate what a mineral *is*. That is, what the chemical composition may be or what form it may assume or what it may indicate.

A more rational method is to name a mineral according to its form, habit, lustre, color or chemical composition. Today, an effort is being made to name minerals more systematically. The last chapter of Part I discusses the rules for naming minerals. With a characteristic ability for giving a great deal of information in a small space, the author details the difficulties encountered when trying to name a new mineral or modifying old names. Names for new minerals must have the approval of the International Minerological Association.

The fashion for naming minerals in honor of someone started, according to Mitchell, with Abraham Werner in 1783. Although it was not well received and a minerologist, Balthazar Sage, protested, it quickly became the common method for naming minerals. Mitchell makes the interesting observation that the two antagonists to this method, Sage and Estner, never had a mineral named for them.

One of the most recent methods proposed by a Russian, Povarennykh, has not been adopted by the scientific community. Because the terms seem awkward and become progressively complex, one breathes a sigh of relief and wonders if it may not be better to stay with the "devil one knows," at least till a better nomenclature can be found that would be easy for the layman and satisfactory to the professional.

There is no room here to share some of the interesting, charming and delightful bits of information which make this book a treasure chest. Since it is the first book of its kind in over eighty years it is most definitely a different kind of book on minerals.

It will be a welcome addition to the library of mineral collectors and will be one to return to often with satisfaction and delight.

Van Nostrand Reinhold consistantly publishes books of high quality this is no exception.

Mildred Bradley
Staten Island Geological Society, Inc.

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PROCEEDINGS

Staten Island Institute of Arts and Sciences

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THE POND SURVEY, Staten Island, New York
1975-1976 Part VII.

ECOLOGY

by Albert J. Hendricks, Ph.D.

WOLFE'S POND

This pond is one of the largest observed in this survey during the summer of 1975, but it is very shallow, and its waters are very turbid. Despite its relatively great size of a little more than fifteen acres, it is typically only about two feet deep, which perhaps creates a condition in which wind can roll up waves of accumulative action over the shallow water causing bottom sediments to be stirred up constantly. An additional contributor to this turbidity and opaqueness might be the presence of carp and bullheads in the pond. They are both bottom-feeders and stir up mud as they go, but carp can make things especially bad since they are herbivorous and tend to remove pondweeds that otherwise might cover the bottom or at least reduce the movement.

Another factor that contributes to the shallowness and turbidity of this pond and its waters, is the rather extensive erosion of its steep banks in recent years. Probably this erosion was at its greatest in the summer of 1975 because of extraordinary amounts of rainfall that had their effect on the pond's shoreline already denuded of protective grasses, sedges, and herbs due to excessive trampling by human feet. At any rate, after heavy rains, it was observed on several occasions that the pond's water would grow reddish in color because of its receipt of heavy increments of terminal moraine soil around its sides.

It seems probable that Wolfe's Pond will become extinct in another decade or two unless it is dredged out, and something is done to reduce the erosion of its sides. This erosion seems to be especially bad on the east side of the pond, where the main part of the city park lies. Here, a thin line of trees and shrubs alternate with open spaces that are usually deeply eroded and fissured. Indeed, some of the taller trees on these eroding banks are dying as some of their soil support disappears each year, and some of them now present a hazard to children and strollers. Some of the trees seen along this bank were black willow, shining willow, black cherry, red oak, white oak, pin oak, willow oak (seen near the custodian's building), sweetgum, red ash, silver maple, scarlet oak,

and red maple. Examples of shorter trees found are gray birch, sassafras, and black birch. One specimen of serviceberry was noted.

Tall or short shrubs seen include silky dogwood, arrowwod, common elder, red chokeberry, and swamp leucothoe. At several locations, American bittersweet vine was seen coiled among the upper branches of some bushes, while nearby was a colony of the climber sweet autumn clematis. On the north and west sides of the pond, the wood was observed to be in better condition, and is more mature than elsewhere in the park. Typical tall trees there are sweetgum, red oak, sassafras, and tulip-tree. Shorter trees and tall shrubs noted include flowering dogwood, ironwood, black haw, arrowwood, and spicebush.

The little brook that provides an inlet into the pond on the north side widens out into a mud flat that was seen to have a small colony of rose mallow, and a small number of the tall-stalked, beautiful cardinal flower. Other marsh or water-margin herbs found were numerous arrow-arums, some water smartweed, a colony of dotted smartweed, some balsam, and some water horehound.

Wolfe's Pond was also found to have in it painted turtles, snapping turtles, bullheads, and carp. The latter, as noted earlier, tend to stir up bottom sediments of ponds and they consume pondweeds. If there are too many of them they can cause a pond to become sterile, muddy and uninteresting. Macroscopic organisms observed in the pond's water included several large jelly masses of *Pectinatella, magnifica,* small numbers of *Dugesia* sp., some segmented worms of a species of *Aeolosoma,* small numbers of seed shrimp, such as *E*ucypris virens, and large quantities of a water flea. Microorganizms observed were mainly algal forms such as species of *Euglena, Oscillatoria,* and *Nebrium.* Some rotifers such as *Brachionus bidentata* were also seen.

SEGUINE POND

As mentioned previously, this pond at one time must have been one of the most beautiful on the Island because of its location and its topography. It is located along the west side of Lipsett Avenue between Hylan Boulevard and Raritan Bay. The glacial till banks around the pond's edge are high and steep, and are presently much exposed to weathering, although formerly they must have been at least partially clothed with shrubs and perennial herbs. The outlet of the pond is a very small brook that runs for only about forty feet between the pond and the Bay. As is the case at Salt Pond, only the sandy beach separates the pond from the sea. There must have been some pleasant views at one time that included the pond, the beach, and the sea. Now the vista

is one of an abused pond with the back-ends of quite a number of tumble-down cottages and shacks on the cliff banks' tops, along with great volumes of junk and trash which cover slopes of many parts of these banks, and have frequently rolled into the pond itself.

Along the Lipsett Avenue side of the pond, typical trees of the canopy were identified as hackberry, white mulberry, black cherry, and sassafras. These were frequently heavily interlaced in their upper branches with vines of American bittersweet. The second story consists mainly of sassafras, white mulberry, and tree-of-heaven saplings. Ground cover by plants was estimated to be only about fifty percent, with the rest of the cover being trash, rocks, and a poor walking trail. This cover consists mainly of a tangle of vines of Japanese honeysuckle, poison ivy, and virginia creeper. A number of long trailing stems of northern dewberry grow there too. Also seen, were some common weeds such as burdock, cocklebur, great ragweed, and common ragweed.

On the inner shoulder of the sandy beach, but on the edge of the point where the pond gives way to its outlet, some protection for the pond from salt spray by a shrubby copse of common indigobush and dwarf sumac was observed. Nearby in shallow water there was a small colony of rose mallow, and the tall, flat leaves of a monocotyledonous plant that might have been common cattail. On the high beach, a number of weeds, grasses, and sedges were seen near the outlet. Some of these were cocklebur, burdock, sandbur grass, and umbrella-sedge. These were growing on the high beach shingle near the shrubs.

The water of the pond in early summer was more often murky and turbid than it was clear, and the Secchi disk disappearance point was usually about two feet. The Secchi disk is a simple device commonly used by aquatic ecologists to get some idea about the opaqueness or turbidity of water. It is a disk 20 cm. in diameter with four alternating black and white wedges painted on it. A chain or rope with linear measurement units is attached to the center of the disk. When the disk is lowered in the water in turbid water it soon becomes difficult to distinguish black from white and the disk disappears altogether. The depth at which this disappearance takes place is measured on the lowering-chain (or rope). Despite the usual lack of transparency of the water of this pond, its other chemical and physical factors seemed to be good for many organisms as the biotic diversity seemed to be considerable.

The pond was observed on June 24, August 25, and on October 8. Initially, the water had only 25 mg./l. of chloride, which was considerably below the early-summer salt content of Salt Pond on Princess

Bay, but it was also five times as high as that typical of other ponds in this study. The DO/CO_2 ratio (10/4) was good, and the pH was slightly alkaline (pH 7.1). Evidently, the primary productivity of algae and pondweeds was sufficient enough to allow for many kinds of animals to find shelter or food in the water of the pond. Associated with the pond, or at least seen in the vicinity, were birds such as mourning doves, green herons, American crows, mockingbirds, starlings, barn swallows, and belted kingfishers. Damselflies and dragonflies commonly seen over the pond here were much the same as those seen on other ponds. Near the beach some common sulfur butterflies, as well as some cloudy winged skipper butterflies were identified.

In the water of the pond a great number of snapping turtles were seen, and an observant resident reported having seen some muskrats and a musk turtle in the water. Bullfrogs were frequently seen and heard, and a few carp and black bullheads were noted in the water. These fish were greatly outnumbered by small green sunfish. By later August, some rather extensive drifts of big duckweed had developed, or invaded, the northern end of the pond near its inlet. Early in the summer, virtually the entire bottom of the pond seemed to be covered with a green carpet of the alga, although this plant declined through the summer, and was eliminated visually after the invasion of sea water from Raritan Bay during the last week of September. On October 8, the sandbar dike separating the pond from the Bay was observed to have been breached; and at low tide the pond was seen to drain almost completely except for a few shallow puddles here and there. Later, the exposed flats and pools were completely inundated by salt water at high tide. But in August, well before the salt water invasion, some of the small organisms seen were frequent clots or colonies of coarse-filamented algae such as species of *Rhizoclonium, Vaucheria,* and *Spyrogyra*. Small animals feeding or sheltering in these algae were: large numbers of a species of the snail *Physa;* numerous seed shrimps; some stonefly nymphs; great quantities of water fleas, including species of *Daphnia;* and, large numbers of species of *Cyclops* and a species of *Gammarus*. Microscopic algae observed included *Euglena* sp., *Desmidium aptogonium, Docidium* sp., and *Anabaena subcylindrica*. Also, seen rather frequently were the motile hollow spheres of a species of the alga *Volvox*.

Discussion of the Ponds in the Collective Ecosystem on Terminal Moraine on High Elevation over Serpentinite

Ohrbach (Flagg) Pond, and Walker Pond constitute the ponds studied in this collective ecosystem, which seems to be greatly influenced by hilly, relative high topography. This higher land occurs because the terminal moraine here rests on top of thick deposits of serpentinite rock. Ohrbach Pond is at an altitude of 250 ft., but is still well below the crest of the hill that it is on; Walker Pond, however, is much lower down on this same huge hill at an altitude of about 100 ft. Terrestrial ecology aspects around these ponds indicate that adjoining woods approach those of the upland type, although not of the xeric, or dry woods kind. The two ponds and their surrounding terrain provide some interesting contrasts, and at least one paradox. To illustrate: Ohrbach Pond is without doubt not only the most beautiful pond studied in this survey, but is also the one in the best, most balanced condition from an ecologic point-of-view. But Walker Pond, though it is still attractive scenically, is a badly threatened pond in a highly eutrophic condition, and might be on the verge of extinction. The anomaly or paradox in this ecosystem is that the woods and grounds around Walker Pond are in better condition than those around Ohrbach Pond, where the terrestrial ecosystem is generally in poor condition. In the latter case, hard-packed hiking trails and paths criss-cross everywhere and there is much evidence of hikers in great numbers not using the trails; leaf litter, banks, and hillsides are excessively trampled. Also, all too frequently in the area, trees have had all, or most, of their lower branches removed below a height of about eight feet, which perhaps ought to be termed the upper "browse" line for boys foraging for firewood.

The woods leading to Ohrbach Pond on its east side are on a steep slope below a more gentle but continuous rise to the hill's crest to the east a mile or so away. The dominant trees in the canopy of this wood are tall red oaks, although lesser numbers of white oaks are also present. Scarlet oaks can also be seen, and closer to the water, some pin oaks occur. The second story was observed to consist of a mixture of younger trees and shrubs of various heights such as black birch, sweet gum, white oak, gray birch, sassafras, highbush blueberry, arrowwood, and swamp azalea. At a lower level, close to the ground, there are numerous bushes of early low blueberry. Frequently, at the water's edge a thin or scattered shrub zone was seen that consists mainly of arrowwood and swamp azalea, sometimes mixed with gray birch. This intermittent shrub zone seems to give way ordinarily to a lower fringe of the semiwoody swamp loosestrife, which in turn is replaced by arrow arum,

which grows in the shallowest water of the pond. At one point on the east side of the pond there is a large neck and extension of the water that is very shallow and was seen to be saturated with rooted plants of water crowfoot that extends to the water's surface, or above it slightly, and produces many small white blossoms. Occasionally, small colonies of yellow water lily make way for themselves among the water crowfoot plants. The main body of the pond, which perhaps could even be considered a small lake, was found to attain depths of up to ten feet, with a possible thermocline at around nine feet. At any rate, on July 11, the temperature of the "hypolimnion" below nine feet was 74 degrees Fahrenheit, while the "epilimnion" water above nine feet showed on the thermometer temperatures of 80 to 82 degrees. The water at all times seems to be exceptionally clear, which was helpful in learning that water crowfoot was growing on an estimated eighty percent, or more, of the pond's bottom. This interesting plant would attain heights of five or six feet in the deepest water, where it could not reach the surface to produce its flowers, as it did in shallower water. Floating just under the water surface scattered but large colonies of either leafy pondweed or bladderwort were commonly seen. There must have been some water milfoil there too because many of its seeds were identified in benthos samples collected.

Organisms identified from benthos, plankton, periphyton, and floating (neuston) are as follows: *Benthos.* Microscopic animals: *Amoeba limax, Difflugia corona, Heterophrys myrioda, Astasia trichophora, Centropyxis aculeata, Arcella discoides, Paramecium caudatum,* and *Arcella vularis.* Algae: *Peranema trichophora, Desmidium schwartzii, Cosmarium botritis, Micrasterias truncata, Tabellaria fenestrata, Stauroneis gracilis, Synedra parasitica,* and *Pinnularia biceps. Periphyton.* Macroorganisms: Statoblasts of *Pectinatella magnifica.* Microfauna: *Difflugia corona, Trichoda pura, Actinophrys sol,* and *Frontonia leucas.* Algae: *Chlorella vularis, Cylindrocystis diplospora, Closterium moniliferum, Microspora amoena, Ankistrodesmus falcatus, Zygnema* sp., *Tabellaria fenestra,* and *Synedra* sp.

Plankton. Microfauna: *Trachelomonas hispida, Astasia trichophora, Trichoda pura, Cinetochilum margaritaceum,* and *Halteria grandinella.* Algae: *Micrasterias truncata, Micrasterias sol, Pediastrum boryanum, Desmidium schwartzli, Staurastrum pilosum, Staurastrum rotula, Cosmarium botritis, Tabellaria renestra, Tabellaria floculosa, Pinnularia biceps,* and *Navicula* sp. Neuston (floating on surface). *Macroorganisms:* Spicules of fresh water sponges; gemmule of *Meyenia mulleri;* statoblasts of *Fredericella sultana (Bryozoa). Microfauna: Arcella vulgaris.* Algae: *Tabellaria fenestrata, Fragiliaria capucina,*

Navicula radiosa, Chlamydomonas pulvisulus, and *Tetraselmis* (=*Platymonas*) *limnetis.*

The usual dragonflies and damselflies were seen hovering or flying over the pond, except that there seemed to be great numbers of what were probably black-winged damselflies. Insects typical of those found in or on other ponds on Staten Island were also found here, as for example, the same water striders, water boatmen, whirligig beetle, and others. However, it did not seem that the density of populations of these insects was as great as seen elsewhere. It might be that the size and depth of the pond could have effected a wider but numerically finer dispersal of these various water bugs, beetles, and assorted insects.

Considerable numbers of the snail, *Helisoma sp.* were seen, and many bullfrogs were heard along banks with less human traffic. The water was seen to have a good variety of fish in it, and a number were caught to measure and weigh—and subsequently, to return to the pond. Bluegills caught usually weighed between 2 and 3 ounces and were 4 to 5 inches in length. Some crappies or calicos, and some common sunfish were also caught and measured. The calicos were 8 to 9 inches long and weighed about a half-pound, while the sunfish were about 6 inches long, and usually weighed about 5 ounces. Some small large-mouth bass—about 2 ounces and 5 inches—were caught, but much larger ones were seen swimming in the shallows of the pond. These were estimated to be around 15 inches in length, but would not take any bait on the day seen.

WALKER POND

This small pond is at perhaps the lowest altitudinal level of High Rock Park, which adjoins Pouch Boy Scout Camp close to one end of Ohrbach Pond. Predominant trees in the canopy of the woods around this pond were identified as sweetgum, red oak, black birch, and pin oak. Common woody plants of the tall second story were observed to be mainly specimens of sassafras, black birch, highbush blueberry, sweetgum, and flowering dogwood. The short second story is a mixture of plants such as broadleaf meadowsweet, highbush blueberry, white oak, red maple, black birch, beech, chestnut oak, and pinxter-flower. Ordinarily, there was a good leaf-litter on the ground, and this litter was interspersed with saplings, seedlings, or suckers of broadleaf meadowsweet, lowbush blueberry, red oak, chestnut oak, red maple, and pinxter-flower. in June, the water of the pond was clear, about four feet deep, and was only about half covered with floating plants and with leaves and flowers of plants rooted in the pond bottom. However, late in

the summer of 1975, the entire surface of the pond was covered with green vegetation.

Plants on the pond that first attract the eye are fragrant water lilies, which were present in two good-sized colonies. These water lilies, along with water crowfoot were noted to make up an estimated eighty percent cover of the bottom of the pond in June. But, much of the water above the rooted water crowfoot was clear at that time. Lesser duckweed, and watermeal covered an estimated thirty percent of the water surface at that time of the season, with the floating leaves and flowers of fragrant water lily accounting for about fifteen percent of the water's surface area. So, early in the summer there was a good amount of uncluttered water surface area; however, by August the entire surface of the pond was covered, mainly by the watermeal. It should also be mentioned that a colony of mild water pepper formed a dense colony, averaging some ten feet in width, along about half of the pond's water margin.

A quadrat sample taken of the water crowfoot and fragrant water lily, used to calculate pondweed productivity, revealed a calculated growth of 13,270 pounds per acre. Of course, separate samples could have been made for the water smartweed and for the floating watermeal and lesser duckweed. Probably these plants combined would double the productivity value obtained for the submerged rooted plants. It should be mentioned that small drifting colonies of bladderwort were seen in the pond too, but their relative number and volume was small.

Numerous bullfrogs were heard around the pond, and numbers of small fish were observed to be rising and jumping to take insects out of the air. Many dragonflies and damselflies were seen, as well as a variety of water insects. The fish caught were all bluegills, 6 or 7 inches long and weighed four to five ounces. Macroscopic organisms observed included nymphs of a damselfly, a small number of mites (the spotted *Hygrobates longipalpis,* and the green *Arrenurus superior*), several thread-like worms of *Catenula* sp. (Catenulida), and myriads of *Cyclops* sp. and *Daphnia* sp. Common microorganisms were seen to include algae such as species of *Oscillatoria* and *Cosmarium*; and, small animals such as *Paramecia* sp., and rotifers like *Philodena roseola.*

Identified organisms collected in plankton samples included the following: Macroorganisms: worms such as *Tubifex* sp. and *Aeolosoma hemphrichi* (Oligocheta); a few *Hydra oligactis*; and some gemmules of *Spongilla lacustris,* as well as some statoblasts of *Pectinatella magnifica.* Microorganisms: Fauna. *Difflugia urceolata, Paramecium caudatum,* and species of *Stentor, Amoeba, Colpidium* and *Oxytrica.* Algae. *Oscillatoria limnetica, Oscillatoria granulata, Euglena elastica, Scenedesmus quadricauda,* and species of *Spirogyra, Vaucheria,*

Ulothrix, Protococcus, Amphora, Pinnularia, Gomphonema, Fragilaria, Asterionella, and *Cymbella.*

As for birds, according to one source, redwing blackbirds and grackles are common around the pond, except in mid-winter. A mockingbird sings from a tree near the water's edge the year around. Robins, chickadees, tufted titmouse, and others can be seen near the water's edge the year around. Mallard ducks too have been observed to swim periodically on the pond the year around. In April, the eastern phoebe was seen to use a log on the pond to catch insects. In May, a kingbird was observed to use the same log as the phoebe a month earlier for the same purpose. Other birds that like to be near water seen in May were some Canada geese, a spotted sandpiper, and a blue-gray gnatcatcher. A kingfisher was seen flying over the pond in September. Other terrestrial birds too numerous to list here were seen on nearby shrubs and trees of the deciduous woods surrounding the pond.

Discussion of the Ecosystem on Palisade Diabase Rock

QUARRY POND

This pond, near the intersection of Victory Boulevard and Travis Avenue, on the William T. Davis Wildlife Refuge, is unique on the Island in that it rests upon, and is surrounded by, outcroppings of the Palisade diabase, or traprock. This rock forms the New Jersey Palisades northeast of Staten Island. Even though this is the only pond found on this kind of foundation, it must be recognized as belonging to an ecosystem of its own. For example, water chemistry analysis for the pond shows a number of probably significant differences from the Travis Ponds, which are only some three hundred yards away but are not on traprock. In Quarry Pond, the water is somewhat alkaline (pH 7.6) while the Travis Ponds are acidic (pH 6.4 and 6.7 for the two that were included in this survey); total iron here is 3.8 mg./1., while the Travis Ponds have very little iron (0.4 and 0.9 mg./1); and, the H_2S reading for this pond was higher than that found from water supplies in the Travis Ponds.

In addition, the vegetation around this pond is arranged in some very interesting stratified zones that are not seen at all around the Travis Ponds. North and east of the pond, the graduation of plants from nearby grassy fields to the outer zone of trees, and inward toward the pond's edge, was observed to be about as follows: The wet grassy meadow to the

east, between Victory Boulevard and the pond was seen to be densely covered with tall switchgrass, which was found to provide excellent cover and nesting sites for ducks. To the north of the pond, on drier ground, broom sedge was common, and was mingled with low, sharp stems and canes of catbrier and blackberries. The tree zone was noted to include numerous pin oaks, 25-35 ft. high; next, numbers of gray birches, some 15-25 ft. high; then, many black haw shrubs or low trees; next, some dwarf sumac thickets and numerous scattered chokecherry shrubs; and, in the innermost circle of trees and shrubs, some scattered white ash saplings, and several black willow trees. Growing from clefts in the traprock, were several specimens of an uncommon variety of poison ivy that was shrubby rather than vine-like.

Also in this same zone a number of dispersed specimens of swamp (or silky) dogwood were noted. On the ground, Virginia creeper vines were very numerous, and many individuals of herbs such as evening primrose and pokeweed were seen, as well as a few bushes of highbush blueberry and common elder. As for the pond itself, the shallow water had been invaded for about fifty percent of its area in early summer by mild water pepper. However, by the middle of August, an estimated eighty percent of the pond's area was occupied by this emergent jointweed. The productivity of this *Polygonum* was calculated at the extraordinary amount of 20,335 pounds per acre, which was the highest figure obtained from any of the ponds studied in this survey! As an afterthought, perhaps it should be at least mentioned that great quantities of fruits of leafy pondweed were identified from mud sediments of the pond, though the plant itself was not collected. Flying insects and water insects seemed to be as numerous as seen elsewhere, but their variety appeared to be less. Large numbers of a *Physa* sp. snail were seen. As for macroscopic animals,. there were relatively small numbers of some species of *Cyclops,* but incredibly high quantities of a water flea. Microscopic animals were exemplified by great numbers of some species of *Paramecia,* and lesser numbers of *Didinium nasutum* (Ciliophora).

Discussion of the Ecosystem on Ground Moraine and Upper Cretaceous Sands and Clays, North of Fresh Kills Estuary

The two ponds surveyed in this ecosystem are Travis Ponds 1 and 2, about 150 yards north of the intersection of Victory Boulevard and Travis Avenue. These two ponds are part of a series of artificial, rectangular, small bodies of water, which are themselves arranged in a rectangular pattern in an area to the north and east of Travis Avenue, between the Parcel Post Building and the Little League Baseball practice fields. Travis Pond 1 is furthest from Travis Avenue, and parallels it,

while Travis Pond 2 is closer to Travis Avenue, but is perpendicularly oriented to it. At present (1975), these ponds are included in the land set aside by New York City municipal government for an industrial park, and it may be that an earlier city regime had these ponds created with the formation of a mini-park in mind. In any event, the five or six ponds that comprise the group could still be attractive if all of the junk and litter could be taken out of them, as well as away from their banks, adjoining grounds, and the nearby dirt road that leads to them. However, as of this writing, saving these ponds might be a lost cause since the practice fields for baseball have been extended southward to such an extent that one of the ponds has been totally filled-in, and a drainage canal of large proportions has been dug across the rectangle of land where the ponds are located.

Northeast of the park-like rectangle of these ponds, there is an extensive and beautiful oak woods, between South and Graham Avenues, that extends for a mile and a half to two miles to the northeast. This is part of the industrial park land, too. The soil beneath this oak woods, as well as close to the ponds, is light yellow to gray sand with varying amounts of humus in it, or on it, depending on localized vegetation. Tests of water extracted from this sand showed that it is very acid in nature (pH between 5 and 6), and is, of course, not related to the diabase rock under nearby Quarry Pond. It seems possible that this sand represents outwash from streams that had been provided at one time by glaciers in the vicinity. Reasons for the acidity of this sand are not entirely clear, although several contributing factors can be recognized. First of all, deciduous woods produce a leaf-litter that tends to be acidic when it decomposes. In addition, for many decades now, there have been recurrent heavy volumes of industrial smoke, fumes, and residual ash and cinder particles blowing over this part of the Island from New Jersey. Undoubtedly, much acid precipitation has resulted from combination of sulfur oxides and water, for example, and quite a bit of this loaded liquid must have fallen on the Island's north and west shores in the past.

TRAVIS POND 1

Whatever the originating reasons or factors might be, Travis Pond 1 is a little gem with its crystal clear water, and its interesting biota. Terrestrial vegetation around all of the Travis Ponds, as around this one, is in a h ighly disturbed state or organization, and none of it appears to be very old. Close to the northeast side of Travis Pond 1 there is a scrub woods of poplar and sweetgum that forms a kind of transition zone between the ponds and the rather mature oak woods previously mentioned. On the south and east sides of the pond, especially close to the

access dirt road, much solid refuse has been dumped. In fact, the southern end of the pond itself has had numerous old rubber tires and other rubbish thrown into it. Possibly, this is one factor that makes this otherwise very clear and transparent pond so interesting. The floating or submersed rubbish provides a strange contrast to the rich flora in the pond. Fragrant water lily colonies were observed toward the north end of the pond. The bottom of the pond was thickly covered with leafy pondweed, mermaid weed, and false loosestrife. The pondweed and mermaid weed covered an estimated ninety percent of the pond's bottom. On top of the pond's steep banks, or nearby, there can be seen a few low trees of black willow, sweetgum, large-toothed poplar, and red maple. These stand guard on the pond's steep banks, while between them grow scattered clumps of chokecherry, dwarf sumac, arrowwood, and an occasional bayberry shrub. Also, here and there, fox grape vines or blackberry canes can be seen among the branches of the shrubs or arcing over the tops of tall grasses and sedges. Next to the water, bulrush was noted to have established a few clumps, along with some lesser sedges and grasses.

Some of the birds seen in the vicinity of Travis Pond 1, or near the other ponds of the group, were identified by a bird-watcher as: oven birds, flickers, green herons, and snowy egrets. Infrequently, a great blue heron was seen at one of the Travis Ponds, especially early in the morning. Eastern cottontails were often seen scampering below the bushes, while bullfrogs croaked along the pond's banks, and their large tadpoles could be seen blowing bubbles.

Small animals in Travis Pond 1 water included considerable quantities of a snail (*Physas* sp.), numerous pupae of midge flies, and many green hydra. Microorganisms observed were algae such as species of *Volvox, Spondylosum, Cosmarium, Sphaerozosma, Plectonoma,* and *Chroöcoccus*. Myriads of some species of *Cyclops* were also seen. As mentioned before, the waters of this pond were found to be slightly acid (pH 6.4), which is not surprising in view of the acid sands near the pond (pH 5-6).

TRAVIS POND 2

This pond lies along the north side of the dirt access road off Travis Avenue, but quite close to it. Unlike Travis Pond 1, its waters were found to be usually turbid or muddy. Otherwise its physical and chemical features (i.e., pH 6.7) were rather similar to those of Travis Pond 1. Near, or along the steep north bank of the pond, a mixed scrubby vegetation was seen that contained in it pin oak, Russian olive,

groundsel tree, bayberry, and highbush blueberry. The west bank of the pond, which was largely formed of hillocks of rubbish landfill, had a covering of weedy plants like pokeweed, Joe-Pye weed, and tall red-top grass. The northeast side of the pond was seen to have a large colony of tall reed grass on the shoreline, while nearby there were some patches of switchgrass, and a long, dense colony of mild water pepper. There was also a large mass of this mild pepper growing well out in the pond where it formed a circular "island." Along the road side of the pond, dwarf sumac bushes, wild rose canes, and chokecherry bushes were noticed to form a barrier between the road and the pond. Close to the water a colony of bulrush was noted.

Perhaps because the water of this pond was so often turbid and opaque in the summer of 1976, pondweeds of the submersed, rooted kinds did not seem to grow too well. However, there were a few muddy and blackened colonies of leafy pondweed floating about, or anchored in the thick mud. Macroorganisms in the water included very large numbers of species of *Diaptomus* and *Cyclops* (both are in Copepoda), some pupae of midge flies, and swarms of some species of *Planaria*. Microorganisms noted included algae such as species of *Closterium* and *Treubaria*; and, small animals such as a species of *Stylonychia* (Ciliophora), and some *Chromogaster ovalis* (Roltifera).

GEOLOGY & WATER QUALITY

by Hans Behm, M.S.

WOLFE'S POND

Wolfe's Pond is located in Wolfe's Pond Park, Princess Bay, south of Hylan Boulevard and east of Holton Avenue. The 1896 historical geology map shows the presence of a small pond, approximately one-third of its present size, at its northern terminus. At present, the pond is 2,150 feet long and 650 feet wide at its southern end. The surface area is approximately 653,766 square feet, or ca. 15.25 acres. It is approximately 0 to 2 feet above sea level.

Geologic Setting. Glacial till of the Harbor Hill moraine surrounds this pond very prominently, which resembles Arbutus Pond in many respects, except that Wolfe's Pond only averaged 2 feet in depth. Arbutus Pond is deeper. The lack of vegetation near the banks and shore is due to heavy pedestrian use, which has killed the plants. This enhanced the rate of erosion, resulting in the development of prominent gullies, much of the debris having been deposited on top of the bottom muds in Wolfe's Pond. The moraine is similar to that surrounding Arbutus Lake, as far as constituents are concerned.

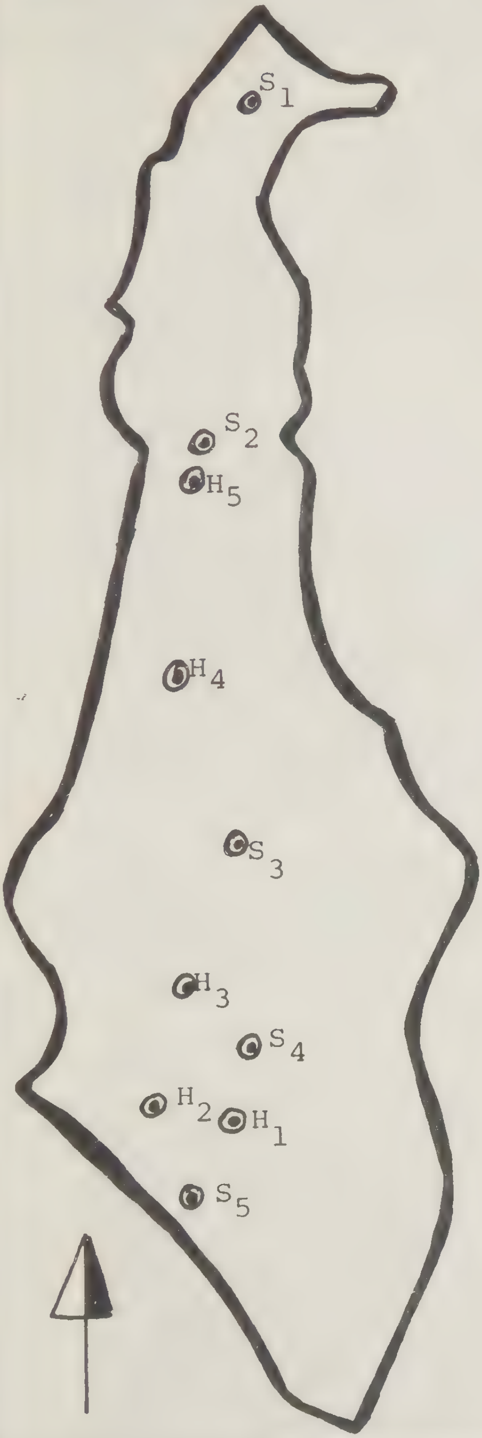
Examination and microscopy of the underlying strata indicate that this pond, like Arbutus and Seguine's Ponds, was once an arm of the sea. Indeed, the old maps of 1887 show an extensive marsh area where the pond is now located.

The stratigraphic sequence beneath the pond is as follows: Thin veneer of glacial till; gray and bluish gray clays typical of salt-marsh deposits and containing many brackish-water foraminifera; black oozy organic muds, containing testacea, plant debris and insect parts, overlain by red-brown muds derived from erosion of the adjacent glacial deposits, the result of excessive precipitation.

Description of Sediments. The glacial till of the Harbor Hill moraine typically consists of reddish-brown fragments of the Newark Group's shales and sandstones, rounded and surbrounded mostly; gneiss and granite of many varieties; quartzite, conglomerate, basalt, yellowish and whitish sandstone, jasper, and dark fissile shales.

Microscopic Description of Sediments. There is an abundance of clear and transparent glassy quartz, largely angular, but subangular in the

WOLFE'S POND



SAMPLE DEPTHS (water)

S_1 = 13"
S_2 = 22"
S_3 = 19"
S_4 = 24"
S_5 = 24"

SECCHI DISK READINGS
(at sample depth sites)

S_1 = 3"
S_2 = 2"
S_3 = 3"
S_4 = 2"
S_5 = 3"

HOLE DEPTHS (below bottom)

H_1 = 24"
H_2 = 16"
H_3 = 26"
H_4 = 20"
H_5 = 48"

WATER DEPTHS at Hole Sites

H_1 = 24"
H_2 = 27"
H_3 = 22"
H_4 = 40"
H_5 = 24"

coarser portion; white and milky fragmental quartz, angular to subangular, with a few subrounded grains; reddish and rose-colored quartz grains, probably due to the disintegration of the Newark Group sandstone constituents; yellowish and limonite-covered quartz, some frosty and well-rounded quartz grains, and a few grains showing the presence of crystal faces; fragments of the Newark Group red shales, which are well represented and which are angular, subangular, subrounded and rounded, many of them elongate; also broken fragments of pink and red sandstones of the Newark Group. There is much muscovite in the finer portion; also, green and brown mica, magnetite, green to dark-green galuconite, gneiss and granite constituents, including white and pinkish feldspar, tourmaline and hornblende.

Microscopic Description of Faunal and Floral Constituents. Among the foraminifera, the most important are *Trochammina inflata, T. macrescens,* both of which are the most frequent; *Tiphotrocha comprimata* (syn. *Trochammina comprimata*), including many early ontogenetic stages, and *Miliammina fusca.* The testacea are represented by *Difflugia oblonga, D. corona,* and *D. urceolata.* The most important diatoms are *Coscinodiscus* sp., *Triceratium favus, Biddulphia pulchella,* and *Surrirella* sp. The most important single bryozoan is *Pectinatella magnifica,* of which also living colonies were found. The remainder consists of fish otoliths, bone fragments, worm jaws, chara, and seeds.

Note. The great abundance of marine diatoms, including many chitinous and arenaceous foraminifera, corroborates the fact that the sit now occupied by Wolfe's Pond was at one time a typical salt marsh. These flora and faunal constituents are found in the gray clays underlying the more recent black organic muds.

SEGUINE'S POND

Seguine's Pond is located 230 feet south of the intersection of Lipsett Avenue and Hylan Boulevard. It can be reached most easily along Lipsett Avenue which runs along the eastern bank of the pond. It is approximately 700 feet long and 290 feet wide at its widest point. The overall surface area varies, but at the time of field operations amounted to about 130,720 square feet, or about three acres. On older maps the actual water surface accounted for as little as two acres. The average depth was 3½ to 4 feet. The pond is near sea level in elevation, but at times has reached two feet or more above sea level when the outflow channel was more or less blocked. The color of the water at the time of

investigations was brownish. The water temperature was 82° near the surface on June 24, 1975. There are a number of creeklets that empty into this pond at its northern terminue.

This pond, which was once counted amongst the most attractive ones on Staten Island, is a veritable disaster area. The southwest shore and western bank are occupied by old and dilapidated beach bungalows and frame houses, with a considerable amount of garbage and debris littering the landscape. This is the worst and the least attractive side. The northeast and eastern shores have a few better homes, but still with much litter and refuse along the banks of the pond. Even the outflow area, including the beach, is littered with much garbage. This condition has made it very difficult, if not impossible, to carry out some of the field investigations in some areas of the pond. In fact, it was downright dangerous to walk along certain sections of the surrounding banks. The glacial till banks of this pond have been extensively eroded due to the high rainfall in the summer of 1975. This is due in large part to the fact that the banks are very steep. Though steep, the slope varies considerably. The steepest slope ranges from 30-42° along its western border and 18-30° alongs its eastern border; at the base of trees the slope may be as much as 70°. Because of this relatively steep terrain, new vegetation is unable to get a foothold. Some erosion gullies are as much as 6 inches to one foot deep or more. On a topographic map, the contour lines are very crowded around this pond.

Like Wolfe's and Arbutus Ponds, Seguine's Pond must have been an open arm of the sea, that is, a salt marsh. It has been changed to a fresh-water body on a number of occasions. But a powerful storm, coupled with excessive rain in late September, brought about strong erosion of its outflow channel, deepening it and causing the pond to drain itself of its fresh-water contents. Since that time, it regularly fills with marine water at high tide and becomes almost a mud-flat at low tide. At the time of this ecological disaster, all the fresh-water fish were killed. I saw many of them lying near the beach and along the exposed areas of the former fresh-water body.

On the old 1913 topographic map an extensive marsh was present at the northern terminus of Seguine's Pond, but was largely filled by the construction of Hylan Boulevard.

Geologic Setting. Seguine's Pond is superimposed on salt marsh deposits, which in turn rest on the constituents of the glacial till of the terminal moraine. The surrounding terrain consists of steep banks of glacial till, which are highly eroded and showing many erosion gullies.

The stratigraphic sequence is as follows: glacial till of the terminal moraine, salt marsh deposits, recent organic muds.

Becauses of the nature of the glacial deposits, the terrain is very rough on the millimeter and centimeter scale, but more gentle and undulating on the decimeter and meter scale. Due to the erosion and the removal of clay-sized particles, pebbles, cobbles, and boulders stand out prominently within the larger gullies. Because of the odd size and great variety of shapes, the porosity of these sediments is low. The glacial till is characteristically reddish-brown, like that around the other ponds along the south shore.

Description of Sediments. In general, the sediments consist of a mixture of Newark Series shales and sandstones; yellowish brown, reddish, gray, smoky and whitish quartz pebbles, brown jasper, all varieties of gneiss and granite, reddish conglomerates, gray shales, greenish and yellowish sandstones, ferruginous sandstones, sandy shales, basalt, fragments of pegmatite, pyroxene and amphibole. The glacial constituents range from angular to subangular, subrounded to rounded, elongate and equidimensional shapes. Like most of the glacial till associated with the other ponds, the size ranges from clay size (1/256 mm) to more than 256 mm, or boulder size.

Microscopic Description of Sediments. There is much clear and transparent, angular to subangular quartz; milky and white subangular quartz; fragments of quartzite, some crystal-faced quartz grains; yellowish and reddish grains of subangular quartz; reddish fragments of share of the Newark Group, largely subangular and subrounded, with a few rounded grains. In addition, the residues contain a great variety of the fragments of gneiss and granite, basalt, ochraceous grains, yellowish siltstone, magnetite, and some mica. Contaminants include plastic grains, glass, coke and coal and aerial particles (fly-ashes)

Description of Faunal and Floral Constituents. The diatoms include *Coscinodiscus* and *Surrirella* spp. and many yet unidentified smaller species. The foraminifera include *Elphidium* sp., a littoral form. Ostracodes were represented by *Cypridopsis vidua* and some brackish-water species. The single most important bryozoan is *Pectinatella magnifica.*

Many of the statoblasts, incorporated into the sediments, were partially fragmented and weathered. There was no evidence of recent colonies, which indicates that this organism was present in the past, whenever fresh-water conditions prevailed and when the waters of this pond were cleaner than they are today. Last summer, the pollution level

of this pond was high. Other organics include many seeds, insect parts, and much plant debris.

Comments on the Weather. There was a great deal of cloudiness on June 25, 1975, with a few breaks. The clouds present were Cumulus, Cumulonimbus, Stratocumulus. The wind direction was from the northwest and there were scattered showers in the afternoon. The visibility was fair and the relative humidity high. The amount of rainfall in the last 48 hours was ½ to 1".

WALKER POND

Walker Pond is located in the woodlands of High Rock Park Conservation Center, northwest of Summit Avenue and the parking place, and west of Tonking Road. The pond's length is 250 feet and its width is about 190 feet. Roughly oval in shape, the pond encompasses a surface area of ca. 1 acre. The elevation is 103 feet above sea level. The average depth is 2 to 2½ feet, but varies from place to place, with a few deeper places. The pond was so thickly covered with white lily patches that it was difficult to collect bottom samples. The pond's bottom is generally firm, except near the northeastern portion, where a thin layer of mud was present. This pond, like many of the fresh-water series, was created by the erection of an artificial levee at its outflow. Previously, that is, about 6 years ago, there was a natural but lower dam. On June 29, 1975, the temperature of the water was 78°F at the surface, and the Secchi disk factor was ca. 3 feet.

Geologic Setting. The pond is located on glacial till of the Harbor Hill terminal moraine, which hides the southeastern edge of the serpentinite, a metamorphic rock. The till consists of classical Wisconsin drift, and the pond occupies a kettle, produced by the ablation of the former mass of glacier ice that was completely or partially buried in the drift. There are many of these depressions along the terminal moraine on Staten Island, most of which are either occupied by swamps or ponds. The island's kettles are generally shallow and have been produced by collapse rather than by sliding.

As a rule, the slopes are moderate to steep: 30° to 40° in places and as high as 60° in other areas. Considerable erosion took place as a result of the heavy rains that swept this area in the Summer, 1975. A system of small gullies and a complex network of tributaries were produced which are present in the glacial deposits, and which brought much silt and mud into the pond's waters.

Description of Sediments. The till is composed of red shales and sandstones of the Newark Group. A great variety of quartz pebbles are present, ranging in color from white, rose, rusty brown to deep red. Some jasper, all varieties of gneiss, granite, basalt, yellowish sandstone, dark shale, some schist and quartzite, are present. The glacial till is of a uniform reddish-brown color and is due to the high percentage of ferric oxide.

Fungi. The higher fungi include: *Amanita frostiana* Pk., *Amanita vaginata* (Bull.) Karst., *Russula emetica* (Fr.) Pers., *Hygrophorus* Fr. *Tylopilus Alboater, Lycoperdon perlatum, Lycoperdum Gemmatum* Batsch, *Polyporus (Polystictus) versicolor* L. *ex* Fries and many coral mushrooms.

Microscopic Decription of Sediments. The associated sediments consist of classical Wisconsin till with a high percentage of red shales and sandstones of the Upper Triassic Newark Group. The samples also contain angular to subangular, clear and transparent quartz, including reddish and hematite-coated grains of quartz. Various granites and gneisses, schistose components, pinkish feldspar, fine-grained grayish sandstone and some diabase are also present. Moreover, quartzite and conglomerate were identified in the coarser fraction of the washed residues.

Description of Faunal and Floral Constituents. The benthos contained a number of long statoblasts, insect parts, seeds oögonia of the charophytes, and a few diatoms. Associated with the sediments was a high percentage of fly ash.

Comments on the Weather. June 30, 1975 was warm with a 75% cloud cover of Stratus in the morning. The wind direction was from the northeast, the visibility was fair, and the relative humidity high.

FLAGG POND

Flagg Pond, or Ohrbach Lake, is located 730 feet east from Manor Road at the intersection of Connors Avenue, or directly east of Sea View Hospital, and west of the Richmond County Country Club.

Flagg Pond is about 1,350 feet long and about 500 feet wide and is highly irregular in its outline and somewhat resembles a bird. The surface area is ca. 11 acres; the depth varied anywhere from 9 to 10 feet. This is the deepest pond we have investigated on the island. Temperature recordings revealed a distinct cooler layer of water near the bottom, proving the existence of a hypolimnion. The temperature

near the bottom at a depth of 9'4" was 74°F and at the surface it was 80°F. The water was exceptionally clear and the Secchi disk point was 8 feet. The pond's elevation is 252 feet above sea level. The following inscription can be seen by the bathing area, near the Berlin Lodge:

> "Formerly called Flagg Pond and being part of the Flagg Estate, this area was purchased by Nathan M. Ohrbach and William H. Pouch, and obtained by the Boy Scouts, a dam was built creating a beautiful 12 acre lake from what was formerly a swamp. In 1951, upon completion of the lake, it was surnamed in honor of Nathan Ohrbach for his dedication to scouting. In addition to fine swimming and boating, this lake offers some of the finest fishing within 100 miles."

Geologic Setting. Flagg Pond is located on glacial deposits of the terminal moraine, which cover the serpentinite which constitutes the structural backbone of Staten Island. A metamorphic rock, it is the result of hydrothermal alteration of peridotite. It is much weathered in its present state and many joints traverse the main rock mass. The pond is surrounded by banks of glacial till of classical Wisconsin age. The till is composed of particles ranging in size from less than 1/256 mm to more than 256 mm. There is a wide spectrum of composition. Every degree of angularity and roundness is present.

The slope varies considerably from place to place along the western margin: 10 to 20°, or 35 to 40°. The eroded banks are interrupted with vegetation and trees. The 1975 heavy rains increased the rate of aqueous erosion, producing many gullies, complexly branched and anastomosed. The excessive erosion increased the rate of deposition and speeding up the siltation of the pond. A single season of above normal preciptation deposits several inches of silt and mud, thereby decreasing the pond's depth.

Description of Sediments. The glacial till is composed of red shales and sandstones of the Newark Group in various stages of fragmentation. Also present are several varieties of gneiss, granite, pegmatite, yellow sandstone, gray shale, diabase and pinkish red conglomerates, all of which are variously shaped and rounded, many of which reveal glacial striae. Erratics are common along the shore of the pond. Near the eastern shore and up the glacial bank, there is a very large boulder of diabase.

Fungi. The following higher fungi were recorded in the nearby woodlands: *Amanita frostiana* (Pk.) Sacc., *Russula emetica* (Schaeff.) Pers., the most abundant, *Russula virescens* (Schaeff.) Fr., *Cantharellus minor* Pk, *Lactarius piperatus* (Scop) Fr., *Gyroporus costaneus* (Bull *ex* Fr.) Quel. and many species of coral mushrooms.


CAMPOREE AREA
Brook
Brook
Brook
MANOR ROAD
PARKING LOT
260'
250'
FLAGG'S POND
STUMP POND
260'
250'
WATER TANK
400 feet
(VANDERBILT MAUSOLEUM)

Microscopic Description of Minerals. The associated sediments are composed of glacial till of the terminal moraine. The microscopic fraction contains much clear and transparent, angular to subangular quartz. The cleaned residues also contain milky and white, angular to subangular quartz and including some grains that are subrounded. Also, I have identified rose-colored, subangular to subrounded quartz. The probes also contain white and pinkish feldspar, mostly angular, subangular, and subrounded; an abundance of the red shales and sandstones of the Newark Group, and many varieties of gneiss and granite. White, brown and black mica, including some magnetite, are also present.

Microscopic Description of Faunal and Floral Constituents. Elongate statoblasts, many species of fresh-water diatoms, oögonia of the charophytes, and many variegated seeds, including much plant debris, are common. Associated with the muddy bottom sediments is much fly ash. Also present are chitinous insect parts and a number of Testacida.

Comments on the Weather. July 9, 1975 was a warm day, with a temperature of 84°F. The cloud cover varied considerably and included the following cloud genera and species: *Stratus* in the early morning hours; *Cumulus Fractus, Cumulus congestus,* and *Cumulonimbus* in the afternoon. There were widely scattered thundershowers. Wind direction was from the southeast, the visibility was fair later in the day, and the relative humidity was high, combined with a low barometric pressure.

QUARRY POND

This small pond is located 375 feet south-southeast of the intersection of Victory Boulevard and Travis Avenue, 400 feet northwest of the bridge over Main Creek, and about 30 feet southwest of Travis Avenue, from where it is easiest to reach it. The pond is about 190 feet long and about 130 feet wide. The surface area is ca. ½ acre, but varies considerably. During protracted periods of drought it almost dries up completely. On August 12, 1975, the water was extremely turbid and the Secchi disk point was O. The depth averaged 1 to 2 feet. No significant sedimentation patterns were observed. The pond's elevation is 10 feet. From the biotic point of view, this small pond is very interesting because of its biological diversity.

Geologic Setting. The pond occupies a depression artificially created by quarrying operations before the turn of the century. The rock in question is the familiar Palisades diabase and structurally a sill. The rock is a

QUARRY POND

medium-grained, basic igneous rock of the basalt family of late Triassic age. The naturally exposed surfaces of this rock that have not been affected by quarrying show evidence of strong glaciation. The glacial striae show the direction of ice movement, which was from the north-northwest. Many hillocks or bosses are present on the surface of the exposure, also due to glacial erosion.

The stratigraphic sequence beneath the pond is as follows: massive, unweathered and much jointed diabase; weathered and crumbly diabase (C-horizon in familiar soil terminology); and, plant debris and much oozy, black organic mud, rich in H_2S gas. Some glacial drift is present along the northwestern margin of the pond.

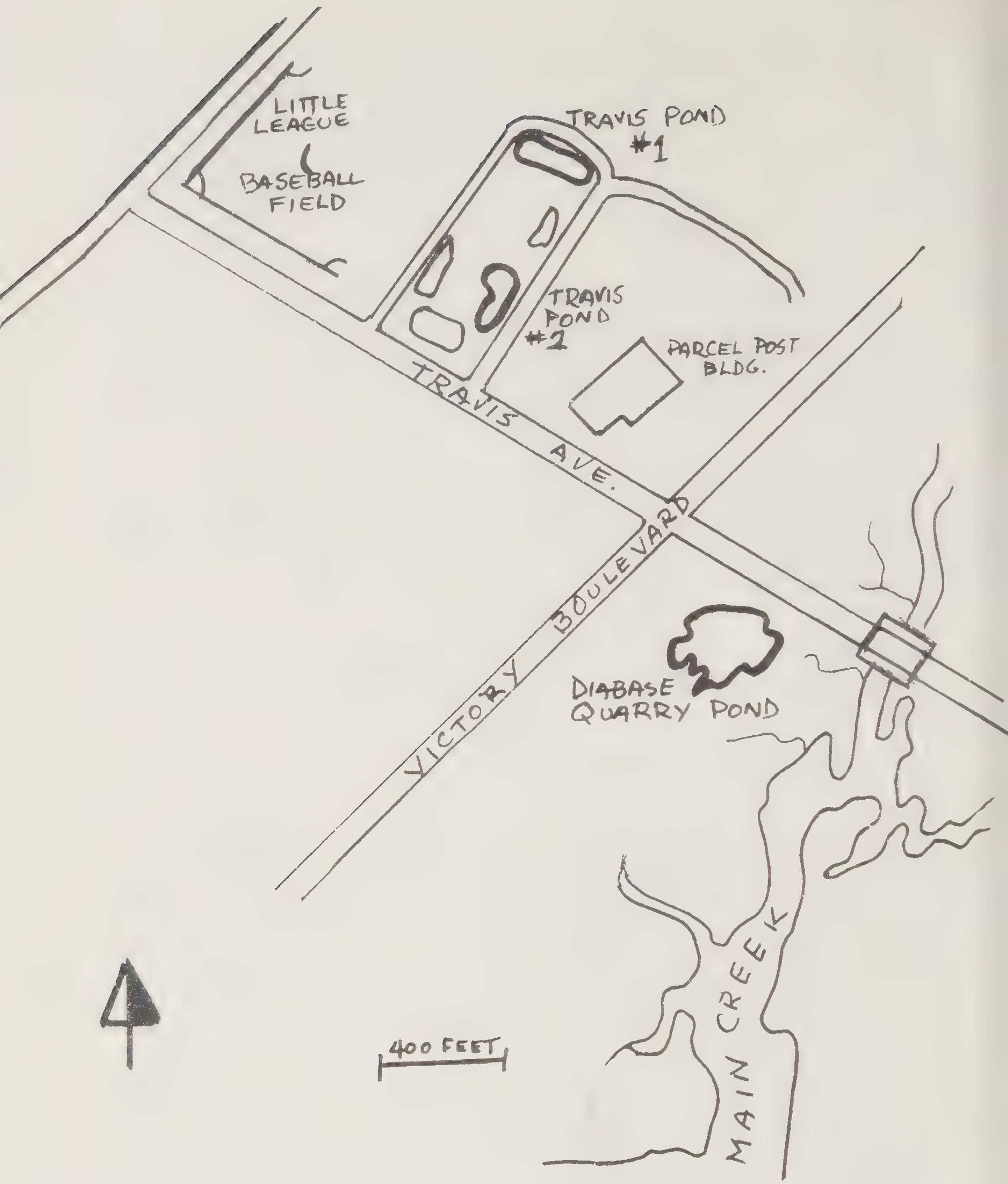
Microscopic Analysis of Faunal and Floral Constituents. The benthos and the periphyton revealed an abundance of gastropoda, many small diatoms, some ostracoda, testacea, insect parts, many seeds and high percentage of fly ash.

Comments About the Weather. August 12, 1975 was very warm and muggy, with a fair visibility and a few scattered clouds.

TRAVIS POND 1

Travis Pond 1 is located in an area that comprises a composite of 5 ponds, 3 of which point in a north-northeasterly direction and 2 which point approximately in a northwesterly direction. Travis Pond 1 is located northeast of Travis Avenue and southeast of South Avenue, and northeast at a mid-point between South Avenue and Victory Boulevard. The pond is about 225 feet long and 60 feet wide, and is roughly rectangular in shape. The depth averaged 1 to 1½ feet. The total surface area averaged 1/3 acre. On August 13, 1975, the water temperature was 76°F at the south end and 80°F at the western portion. The color of the water was green but clear to the bottom, hence, no Secchi disk reading was necessary. Neck Creek drains this area and connects with Arthur Kill.

Geologic Setting. Travis Pond 1 is located on glacial till and glaciofluvial deposits. Beneath the glacial layers is the gently-dipping Newark Series and the Palisades diabase sill. The pond was artificially created. The terrain around the pond is of low relief and almost flat in places. The area has been bulldozed on a number of occasions. The slope varies from 1 to 3°, with a few higher readings in places. The high percentage of the red shales and sandstones of the Upper Triassic Newark Group reflects the proximity of the bedrock of this formation.



TRAVIS PONDS and QUARRY POND

Microscopic Description of Faunal and Floral Constituents. The coarse fraction of the samples consists of many types of seeds and much plant debris, gastropoda and ostracoda. The fines included a few tests of *Difflugia oblonga* Ehrenberg, and a few diatoms. The paucity of organic constituents within the thin bottom muds is due to the fact that this pond is of recent vintage, and there was not enough time for black organic muds, containing the remains of a varied biota, to form.

The periphyton revealed many specimens of the ostracoda *Cypridopsis vidua* (O.F. Miller). Many specimens of *Difflugia oblonga* Ehrenberg, including juvenile forms, were present. Gastropods and desmids were also abundant. The samples included a high percentage of fly ash due to industrial pollution coming from New Jersey.

Comments on the Weather. August 13, 1975 was a hot and sultry day, with the temperature reaching 90°F. The scant cloud cover included *Cumulus* and *Cirrus.* The wind direction was out of the west and the speed 5 knots.

TRAVIS POND 2

Travis Pond 2 is located just north of Travis Avenue, or south of Travis Pond 1. Travis Pond 2 was also artificially created. Geologically, the area has been disrupted by bulldozer activity on a number of occasions. The greater diameter is ca. 150 feet and the lesser is approximately 45 feet. The total surface area is less than 1/3 of an acre. The depth averaged 1½ to 2 feet. The inherent color of the water was brown, due to a lot of suspended clay, increasing the turbidity.

Geologic Setting. Travis Pond is located in an artificially produced depression in glacial deposits, which are typically colored reddish-brown because of the presence of highly fragmented red shales and sandstones of the Newark Group. Very little organic mud is presented on the pond's bottom and very little organic mud has had time to form. Field investigations indicate that the pond is younger, or more recent than Travis Pond 1.

The stratigraphic sequence beneath the pond is as follows: Pleistocene glacial deposits; some traces of organic detritus and much plant debris.

Microscopic Description of Sediments. Clear and transparent, angular to subangular quartz is abundant in the washed residues, including a

few rounded and subrounded grains. In addition, the samples contain much rusty and ferruginous, angular to subangular quartz, including a few rounded grains. Moreover, milky white quartz, mostly subangular, including a few grains that are subrounded, are present. A few purple quartz grains are also found. The processed samples also contain much fragmented material derived from the red shales and sandstones of the Newark Series, much of which is angular, subangular and subrounded; a few grains are elongate. The samples also contain some subrounded magnetite, feldspar, fragmented varieties of gneiss and granite, with some mica being present in the finer residue. Last, some garnetiferous aggregates and some glauconite are also present. There is little or no organic material.

Comments on the Weather. The weather was warm and visibility was good. The sky was partially covered with *Altocumulus*.

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